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MILITARY SURGERY.

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General Considerations.

As in military art generally, new problems are but old problems appearing in a more modern or new guise and requiring modern technical improvements for their solution, so in military surgery familiar problems recur and need old principles and art applied with the latest surgical technique for their more satisfactory solution.

All that I propose to talk about is how in my own knowledge and past experience some of these problems presented themselves, and how they were met in the last war. I may perhaps suggest improvements which might be possible in view of some of the achievements of civil surgery in the last generation.

At this stage it may be appropriate to call attention to the fact that the last war was for the most part a great siege. The Central Powers, after an early phase of a war of movement, were contained and besieged. There were violent sorties by the besieged and tremendous attacks by the besiegers, but for the greater part of the time the casualties could receive early and adequate attention not far from the siege lines. Under these conditions military surgery had time to develop a considerable degree of efficiency. Before the period of siege warfare, and later, when the German retreat set in, the conditions were not suitable for efficient surgery. The old siege organization of surgery showed itself unsuitable and unadaptable for a war in which there was rapid movement of troops in vast numbers.

Accordingly, what I have to say must be understood to apply to the treatment of wounded where it is presumed that a fair amount of stability can be expected in the organization of the personnel and material involved in the treatment of wounded.

Each war has its technical problems. Some can be foreseen, most seem to be unforeseen; and surgically speaking, I have no doubt that these new unforeseen difficulties are most quickly and successfully tackled by young brains.

One permanent impression I have retained of my surgical experiences of the last war was the tremendously valuable elasticity of mind and physical ability of the man aged under thirty-five years. The experience and worldly wisdom of older men often made them very useful as administrators, but they were resistant to new techniques and showed great determination in developing the methods which they had acquired and found useful in earlier life, and a definite resistance to new solutions propounded by younger men to meet novel difficulties.

This same attitude, of course, is met in civil life; but the effects are not so serious as they are in the army, where an unprogressive senior officer can oppose and obstruct the ideas and performance of a junior who has the intelligence and enthusiasm to see a new way out of difficulties.

It is in this capacity that a consultant can be so helpful. As a consultant, the consultant surgeon was of very little value as far as I could see, and his services as a consultant were never really needed; but as an observer of what was being done in his own and other surgical zones and as a disseminator and encourager of sound new ideas and a supporter of active, intelligent youth when opposed by prejudiced middle age, a consultant surgeon could be and occasionally was a tremendously valuable officer. The name of his office is a bad one, in that it is misleading. Surgeon-inspector or director of surgical intelligence, or director of surgical technique would be a better name for the senior officer who could carry out these useful duties.

The prime consideration in military surgery is not the humane one of saving life and alleviating suffering, though these are the main objects of the individual surgeon coming in contact with his individual patient. It must not be forgotten that the reason for the existence of an army medical service is that it should be used to keep up the

fighting power of its soldiers. It must therefore never get in the way by clogging up the battle zone or lines of communication with useless wounded, and it must repair lightly wounded as efficiently and rapidly as possible and get them back into fighting units.

From a military point of view it is of much more value to attend at an early stage, and properly, to a number of comparatively lightly wounded than to achieve a surgical triumph by saving at great expense of time one very seriously injured patient.

It is for this reason that specialists and specialist units are in my opinion undesirable except at base hospitals. The natural tendency is for the specialist to exert his special skill in specially difficult cases, and this is wasteful of time, medical personnel and equipment in a military sense. Furthermore, there is a natural resistance to early evacuation of "interesting" special cases, and this leads to conflict of aims between commanding officer and specialist which does not make for harmonious working; if there is one thing necessary for efficient working of a military medical unit, it is harmonious relations and ready cooperation between the commanding officer and all his officers.

It is obviously desirable to bring the wounded and the surgeon with his outfit in contact with each other as soon as possible. According to circumstances, it may be better to move the surgeon up to where wounded are gathered together, or to transport the wounded back to where arrangements can be made to carry out efficient surgery with as little interference from bombing and shelling as the exigencies of war will permit. Usually the latter will be the better course to adopt. Surgery too near the battle zone is apt to be hurried surgery, and everywhere hurried surgery is bad surgery. Also, from military accidents the efficiency of the arrangements is likely to be grossly interfered with, and there is no doubt that the wounded revive from shock better if they are removed to a position of comparative safety.

However, in a rapid advance it may be necessary to detach small mobile units with a minimum of equipment to follow up and give treatment to selected wounded among groups brought together in aid posts, such as schools, halls, churches *et cetera*. It is a choice between some surgical treatment for a few and a complete failure of all surgical help.

For the sake of clarity I shall assume that conditions are such that wounded are being brought, within a period of eight hours or so of their being wounded, to a medical unit adequately staffed and equipped. It is obvious that it must commonly happen that they arrive in such numbers that it is impracticable to give completely satisfactory treatment to every one of them. At such times it is most important to select from their number those most certainly requiring early attention and of these to select those who are most likely to be worth treating. At quiet times, of course, this does not apply. This classifying is a matter that should be entrusted to an officer who has, himself, considerable experience of operative work, and who has the ability to arrive quickly at the essential diagnosis and to appraise the wounded man's chance of recovery.

In times of stress the senior surgeon can be most useful in dividing his time between the supervision of the work of the classifying officer and that of the work of the surgical teams. He should not be kept at an operating table except for a brief period to give his help in some operative emergency.

The first group will be those too seriously wounded to undergo operative treatment. They will be quickly passed on to the resuscitation team or given ease among the moribund. At the other extreme will be the group of wounded who will not be imperilled by waiting till they can be dealt with at some more distant unit, or when more serious casualties have been attended to.

In the third group, comprising all those who should be treated as soon as possible, there will be an attempt to subclassify the casualties according to the different degrees of urgency; but as fresh batches of wounded arrive and as earlier among the older arrivals are resuscitated, the groups must continually undergo reclassification.

I would therefore again point out that the senior surgeon should at such busy times be constantly visiting, in turn, the arrival and classification section, the resuscitation section and the operation teams. It is most important to pass in to the operators a resuscitated patient just at the right time. If he is left too long, infection becomes too well established, or reactionary hæmorrhage again weakens him, and all the work and time of the resuscitation team are lost.

The time of the operator should be conserved as much as possible for the work which he alone can do—that is, operating. He should therefore have an adequate supply of trained orderlies who can clean up and prepare the operation area and carry out a great amount of the splint applications and bandaging; he should have two anæsthetists or one anæsthetist and an orderly capable of continuing an anæsthetic, and two tables, with a sufficiency of overhead supporting slings so that he wastes as little time as possible and devotes a maximum proportion of his time to operative procedures.

A certain number of wounded should not go straight from the classification section to the operative section. Some should be sent first for X-ray examination for localization of foreign bodies; others with through-and-through wounds, excavated wounds and shattered limbs can go direct to the operators without X-ray examination.

All this means a great deal of organization by the commanding officer of the clerical staff of the layout of sections for one-way traffic, of adequate provision of bearers, reliefs, refreshments *et cetera*. In a well organized unit the work goes rapidly ahead in an atmosphere which is amazingly stimulating; but a muddle or breakdown in any one section, owing, for example, to insufficient or confused bearers, is quickly and irritatingly reflected on all other sections of the unit.

It is not my part today to consider military organization as such; but I have touched on the foregoing aspects since their consideration has seemed to me necessary in that they have a direct bearing on the efficient carrying out of the technical part of the military surgeon's duties. From the purely technical aspect of his work there are some general considerations of military wounds which need to be reviewed. So much that had to be rediscovered and established as standard practice in the treatment of war wounds has passed into the accepted practice of treatment of accidental civil wounds, that little, if anything, need be said to this audience on the matter.

Before saying anything on the technique of the treatment of the actual wound, I think I should say a little about general states arising from the wounding and determining later treatment and progress. I refer to the three related factors—shock, hæmorrhage and infection. In civil surgery you know how mixed up these become and how difficult it may be to interpret the resulting clinical state. In military surgery I thought it was even more difficult at times.

Shock is of tremendous importance, and is undoubtedly made more dangerous by hæmorrhage; both factors contribute to a lowered resistance to infection. Furthermore, a prolonged period of low vitality associated with shock and hæmorrhage may make early surgical treatment impossible with safety, and so many hours then elapse before revival takes place that sepsis has now become firmly established in the contused wound edges, the time for primary excision has passed, and the opportunity for protection against sepsis is lost.

There is also another aspect of the question. As you know, it is not always easy in civil work to be certain how much of a patient's condition should be attributed to shock or to hæmorrhage. In military surgery both factors are usually concerned; but in military surgery the third factor of acute, rapidly spreading sepsis may further confuse the clinical picture. This specially applies to acute anaerobic sepsis. The sudden rise of pulse rate, the pallor from rapid hæmolysis, the restlessness, the falling blood pressure, the sweating and collapse which are observed in rapidly progressing anaerobic sepsis can be, for a time, misinterpreted in their significance.

General shock and hæmorrhage in military work are often closely associated. I cannot give the time to talk

about all the factors concerned in the former, nor to discuss all the suggestions made for its treatment; but as practical treatment certain definite directions can be given. transfusion of blood is of great value, not for the treatment of pure shock, but for the treatment of the wounded soldier suffering from shock, for in nearly every case his shock has been complicated by hæmorrhage. Give him blood and temporary relief from his bleeding, and he is more like a patient to be treated for shock only.

For the treatment of surgical shock in a wounded soldier, stoppage of heat loss is the most important single thing in treatment. We speak inaccurately of "warming up" a patient, as if we were warming up cold meat. This is not so—or at any rate, it is possible to a very limited extent. What one really may accomplish is to apply warm surroundings to a cold patient suffering from shock, so that the little heat he is still capable of producing is conserved and he warms himself up. Therefore, do not strip off his clothes, do not expose his bare skin, and see that he is adequately insulated against heat loss below as well as above. Too often one sees clothes piled on him above while he is still losing heat by lying on a cold stretcher. See, therefore, that he has hot blankets in sufficient amount below him as well as above. It is a stupid thing to pile on unwarmed blankets. In such a case the unfortunate patient wastes a certain amount of his precious heat in warming the bed clothes. A very hot blanket will never burn a patient, and is wonderfully efficient in checking heat loss. It is much better and much safer than hot bottles.

A source of heat loss not sufficiently recognized is the heat loss by respiration. In cold weather particularly, see that the patient breathes warmed air or his own breath under a blanket. You are probably familiar with the simple but efficient method illustrated in several army medical publications of warming the air around a patient lying on a stretcher by the use of a small lamp. It is worth remembering that this "warming up" of the shocked patient can be successfully repeated a number of times during the course of his transport from the scene of his wounding, through various posts, till he comes to the operating table.

Pain must be diminished as much as possible by opiates and by the checking of movement in the painful wounded region. A certain amount has been written about the bad effect, experimentally, of opium on certain phenomena observed in shock; but I have not the slightest doubt that it is bad practice to withhold it if a patient is in severe pain. (If it is available I like the total alkaloids of morphine better than morphine only; but there is no doubt in my mind of the value of morphine in shock from painful wounds.)

Adequate, early and efficient splinting will go a long way to diminish shock during the transport of patients with limb injuries. The shocking effect of rough transport on casualties with what should have been comparatively shockless limb injuries, sent down from the line without proper splinting, was an observation that impressed itself strongly in my memory.

After partly reviving from a state of shock, a patient with a mangled limb may make no further progress, in spite of the usual methods adopted to facilitate recovery. The surgeon should then make a further inspection of the wounded part. It may be that anaerobic sepsis is establishing itself. More likely it is a case of so-called wound shock, and rapid ablation of the mangled muscles, usually by amputation, will be followed as a rule by a rapid recovery from shock. You have seen the same thing in civil surgery, specially in gangrene after a vascular injury; but one sees more of it in military surgery when large mangled masses of muscle exist in a wound.

I have not time now to go into the details of the treatment of the wound. Excision of the devitalized wound surfaces before they are deeply invaded by sepsis is the ideal to be aimed at.

Antiseptics have an undoubted value in military surgery. Their part is to help clean the surroundings of the wound and to help during certain stages of wound excision. To a limited extent some antiseptics may appropriately be used in wounds which, for good reasons, cannot be completely excised. They cannot be a substitute or compensate for inadequate, incomplete, inappropriate surgical treatment, or for treatment which is delayed too long.

It cannot be too strongly impressed on everyone concerned in the treatment of infected wounds that antiseptics applied on the surface of a wound in which sepsis is well established do not get rid of sepsis. The cure must now come from the body tissues and body fluids. Certain applications to wound surfaces undoubtedly help these processes, but not because of any imaginary penetrating, germ-destroying powers. On the contrary, it is quite certain that further harm can be done in an infected wound by the application of strong antiseptics, by syringeing and irrigation under pressure with a variety of fluids, and by mechanical swabbing, squeezing and irritation of the inflamed wound. Syringeing and strong irrigation (specially with peroxide of hydrogen) and probing may open up tissue planes and cause a rapid and disastrous cellulitis.

The Carrel-Dakin method with a solution of hypochlorous acid is effective in destroying and dissolving superficial dead matter and allowing the wound to become clinically sterile at an earlier stage than is possible by other treatment; but it must not be construed as meaning that it is a method by which an antiseptic penetrates deeply into the tissues of an infected wound to bring about its disinfection. As in the Wright method, which uses saline solution, the overcoming of the infection takes place from the side of the living, uninfected tissues and blood vessels.

In passing from general considerations to those applied to special anatomical regions, I shall make reference only to a few items which impressed me as being particularly important.

Limb Wounds.

Before I discuss the special features of war wounds of the head and trunk, it is not out of place to recapitulate some aspects of war wounds affecting fleshy parts, specially in the limbs.

War wounds, with the exception of some rifle bullet wounds, are made by irregularly shaped missiles, and these wounds are contused punctured wounds or contused lacerated wounds. Their surfaces are ragged, pulped, devitalized and contaminated with in-driven septic matter such as clothing and dirt. The problem is how such a devitalized, dirty wound can be surgically cleaned. It cannot be done by washing or syringeing with antiseptic lotions. These measures only further devitalize the flesh with which they come in contact.

If the wound can be treated before organisms have grown past the dead into the living tissue, it may be most adequately cleaned in a surgical sense by the cutting away of bruised skin edges and devitalized soft tissues, after antiseptic cleaning of the surrounding uninjured skin.

If the wound is a long tunnel, or if blood vessels and nerves form part of the wall of the wound, excision of all contaminated structures is not practicable. Accordingly, the surgeon must excise what tissue he can, and incise and extend the wound in such a way as to allow as free a discharge as possible from the wound and to diminish dangerous tension in the limb. If the casualty comes for treatment so late that infection has spread into the living tissues, excision of the wound surfaces will open up lymphatic and tissue spaces to further infection, and may thus cause a rapidly spreading, fatal cellulitis and blood infection. Therefore, wide incision to relieve tension and the provision of drainage should be the limits of conservative operative treatment.

It is in such cases that a quick decision may have to be made between, on the one hand, conservative treatment, and, on the other hand, prompt amputation, which probably will save the life in losing the limb. Many factors enter into the making of such a decision—for example, the age and physique of the patient, the amount of infection present and the apparent constitutional effects of an already established sepsis. A properly trained young surgeon, capable of quick decision and prompt action, will sacrifice more limbs but will save more lives than will an older colleague, whose long experience of what painstaking con-

servatism can effect in serious injuries encountered in civil life misleads him disastrously when he is called on to treat in overwhelming numbers the virulent and rapidly lethal wounds encountered in war.

The dressing of these wounds must be varied according to whether the patient is to be kept for some time at the place where he is operated on, or whether he is to be quickly transferred to some other hospital. If he is to be taken from the war zone, and if he is likely to go for indefinite time without the opportunity of having his wound redressed, then some application such as "B.I.P.P." or the salt pack or paraffin pack may be most appropriate. When he can be treated in one place continuously, the Carrel technique is the best method to adopt in sloughing septic wounds. The saline solution method of Almroth Wright, if used according to his technique, is undoubtedly effective; but it is not so adaptable a treatment in mass as the Carrel method.

Early surgical treatment with barely adequate equipment in hazardous surroundings, followed by quick transfer to a base hospital, is infinitely preferable to late surgical treatment after slow evacuation from the scene of wounding to a safer and better equipped hospital.

Wounds of the extremities form a large proportion of the war wounds in those casualties who survive for long enough to get medical aid. A missile which would produce a quickly fatal wound if it struck the head, chest or abdomen, may produce a destructive effect on a limb; but the wound may not necessarily be fatal.

From a utilitarian point of view, and trying to exclude sentiment, I must say that it pays to spend care and time on a number of limb wounds with the prospect of restoring a large proportion of the wounded to active usefulness, rather than to use up valuable time in long operations on a few patients afflicted by brain or abdominal injuries, whose chances of survival are small and whose prospects of return to useful activity are even less.

Some limb wounds carry so little risk to life or to the ultimate usefulness of the limb that at present time need not be devoted to their discussion. Such, for instance, are the clean-drilled wounds made by bullets at long range, and some of the clean-cut wounds made by fine splinters of bomb or shell, when such wounds do not involve bone, joints or large blood vessels. These can be treated by antiseptic applications to the surrounding skin, an aseptic or antiseptic dressing and, most important of all, efficient splinting to prevent movement.

It cannot be too strongly emphasized that immobilization of a potentially septic punctured or penetrating wound may be the most helpful treatment the surgeon can carry out to assist the natural powers of defence in limiting and overcoming infection in such a wound. It is most important to be careful that this splinting does not anywhere involve constriction or interference with the blood circulation in the limb.

Several factors help to make a limb wound really dangerous. (i) Wounds made by blunt missiles carrying clothing and dirt into the depths of the wound are worse than wounds caused by high velocity bullets or small fragments of bomb. (ii) Generally speaking, lacerated, deep wounds are more dangerous the nearer they are to the attachment of the limb to the body. (iii) Septic wounds of the scapular region, opening up the large cellular subscapular planes, are notoriously dangerous, as also are the penetrating septic wounds of the gluteal muscles and their intermuscular cellular planes. (iv) An arterial wound is generally more serious in respect to fatal hæmorrhage or the risk of subsequent gangrene or ischæmia the nearer the wound is to the body. It should be noted, however, that division or occlusion of the popliteal artery has a worse prognosis for extensive gangrene than has occlusion of the common or superficial femoral artery. Severance of the common femoral artery, if complete, leads to death in thirty seconds; but a severed popliteal artery, after considerable hæmorrhage, may seal itself. It is worth noting that even the largest vessels roughly torn through by a large shell fragment may bleed comparatively little at the time of injury, though of course there is a great risk of fatal hæmorrhage later on.

Septic wounds of the great joints, such as the knee, hip and shoulder, are particularly dangerous and are associated with a high mortality rate.

Comminuted fractures of limb bones, with blasting of small fragments of bone into the muscles, are likely to be followed by violent sepsis with great risk to life, or long illness and disability in the survivors. This specially applies to the comminuted fractures of the femur, when the great thigh muscles are grossly lacerated, and it also applies to the fractures of the tibia and fibula where the calf muscles are badly lacerated by the bone fragments. When the wound is contaminated by fæcal filth, either from the soil or from clothing, there is the risk of fatal anaerobic sepsis, whereas the same type of wound inflicted in clean open country, and uncontaminated by dirty clothing, may cause no such trouble.

Many factors influence the amount of shock associated with limb wounds. Exhaustion previous to being wounded, lying out for long periods in the cold after being wounded, great blood loss, extensive mangling of muscle, extensive comminution of bone, multiplicity of wounds and great suffering all increase shock.

It was a common experience that patients afflicted with multiple bomb wounds after air raids suffered particularly badly from shock. Here there was probably the added factor of nervous shock associated with the mental state produced by physical inaction combined with anxiety and fear suffered for some time by the victims before the wounds were inflicted.

Inadequate splinting of a fractured limb during transport adds greatly to shock, especially if the way is long and rough.

So-called gas gangrene or malignant œdema is a complication of gunshot wounds greatly to be feared when the wound is inflicted in urban districts, or when the soil is heavily manured; but it is not so common in wounds inflicted in uncultivated regions and in sparsely settled lands.

To assist in the prevention of anaerobic gangrene in a contaminated wound, opening up of the wound by incision and the excising of devitalized, pulped muscle should be carried out as soon as possible after the wound is inflicted. The wound should not be syringed nor swabbed with peroxide of hydrogen. Such treatment opens up the tissue spaces and carries infection deeper than before.

Gangrene is more likely to develop when the tissues are anæmic, and such anæmia may come about from gross hæmorrhage or from deficient arterial blood supply consequent on vascular injury, or from a too prolonged application of the tourniquet, or from tight bandaging, or from constriction produced later when an inflamed limb swells inside the confined space of a rigid splint.

In injuries of the lower extremities, therefore, care should be taken to see that the ring of the Thomas splint is not pressing on the femoral vessels; in injuries of the upper extremities, carefully avoid splint and bandage pressure on the axillary or brachial vessels.

When gas gangrene has developed there is the horrible characteristic odour, the limb is œdematous, discoloured a yellowish mottled cyanosed tint like a decomposed corpse, and the wound surroundings crackle with foul gas bubbles when touched. Before these fully developed signs are manifest, one can suspect the early onset of this infection by the sudden rise in pulse rate, restlessness and the characteristic foul smell of the wound. The rapid pulse rate and the profound anæmia resulting from the hæmolytic sepsis may mislead the unwary observer into thinking that the patient is suffering from concealed hæmorrhage and shock.

When gangrene has started, the best way to ensure the wounded man's survival is to get rid of the infected muscle as rapidly as possible. The most expeditious way of doing this, as a rule, is by a rapid amputation above the highest osseous attachment of any anaerobically infected muscle.

At amputation skin flaps may be fashioned; but the muscle should be cut in a plane surface by a single powerful sweep of the amputation knife. If the skin flaps have been fashioned they should on no account be sewn

over the freshly severed surface of muscle, but the whole wound must be left open for days without constriction until all risk of anaerobic infection has passed.

The dressing should be of light open gauze, and should not be covered by thick pads of cotton wool, which soon become sodden with fluid discharge and so convert the dressing into an airtight covering which favours the growth of anaerobes.

Occasionally less drastic treatment is possible by the excision of the complete infected muscle or muscle groups, the wound being left widely open. This leaves a mutilated limb which, however, may be better than no limb at all.

Gas-gangrene antiserum is helpful if given early, and so are the drugs of the sulphanilamide type, for this type of infection is nearly always a mixed infection of streptococci and anaerobes.

X-ray treatment is sometimes very effective in treating this and other forms of acute spreading infection.

The treatment of primary and secondary hæmorrhage needs some comment. There is one rule that needs to be emphasized: endeavour to stop bleeding by securing the actual bleeding spot, not by ligation of a main artery proximal to the bleeding wound.

If blood is being lost freely during the search for the bleeding vessel, it can nearly always be checked by a finger thrust into the wound onto the bleeding spot. While the bleeding is thus controlled the main artery may be temporary blocked by finger pressure or by exposing it by incision and then kinking the vessel by a sterile tape passed under it, which is given to an assistant to hold.

If possible, avoid the tourniquet in operating on gunshot wounds, for, as already stated, the use of the tourniquet predisposes to the development of gas gangrene.

Having found, controlled and identified the bleeding vessel, it may be permissible or desirable to ligate that artery at a proximal level to diminish the risk of secondary hæmorrhage, as the ligated wounded part may ulcerate later in its septic surroundings.

In opening up a gunshot wound one should always be prepared for a sudden burst of bleeding from a large vessel which has been temporarily sealed after it has been severed by some blunt object such as a piece of shell. As I have already stated, such large vessels as the subclavian and common femoral arteries may be thus divided and temporarily sealed till the surgeon unwittingly disturbs the cut end while exploring the wound.

The large lacerated wound associated with a comminuted fracture of a limb bone is a particularly difficult problem. If at the same time injury to a main vessel and one or more of the main nerves has been sustained, it is sounder military surgery to save the patient's life by amputation above the mangled muscle than to attempt, as one might in civil practice, to conserve the limb by painstaking operations. Here the surgeon is confronted with a vast pulped mass of muscle and bone chips, and it is frequently a hopeless task to try to clean such a wound by excision. It is impracticable. These patients with crushed and mangled muscles are often suffering from great shock, and the removal by amputation of a vast mass of disintegrated muscle may be the effective and proper means of saving the patient from death through progressively deepening shock.

A wound involving a joint is usually a source of anxiety. A comparatively small wound of entry, apparently remote from a joint, may yet have admitted a missile which has traversed a long path through the limb to end in a joint wherein it implants a devastating or fatal sepsis. On the contrary, a large wound destroying the greater part of a joint may cause little dangerous sepsis and may be of importance only from the ensuing orthopædic disability.

As a general rule, small punctured joint wounds should be treated conservatively if seen early by excision of the track of the missle, removal of the missile and in-driven foreign material, excision by sharp chisel of the damaged bone and cartilage if it is not very extensive, and then washing out with a large quantity of non-irritating antiseptic, closure of the wound and effective splinting of the limb. Many joint wounds treated in this way will behave well; but if sepsis should ensue, one must be prepared promptly to open the joint widely or to amputate the limb.

When there is extensive bone injury of the joint, one may be able to secure adequate cleaning and appropriate drainage by excision of the articular ends of the bones entering into the formation of the joint. If this achieves the purpose of checking sepsis, the orthopædic problem can be attacked later, or amputation can be performed, according to the result of the primary excision.

When sepsis is established, or when the nature of the bone and soft tissue injuries makes it appear unlikely that the wound can be effectively cleaned by excision, primary amputation is the best treatment.

Head Injuries.

I do not propose to deal with concussion and cerebral compression, as they do not differ greatly from similar lesions in civil practice.

Compound fractures of the skull produced by missiles present special problems when one tries to apply the general principles of excision and cleaning of the wound.

The best anæsthetic for the majority of operations is a 1% solution of procaine widely infiltrated into the scalp and, according to circumstances, into the temporal muscles also. One should apply with reserve to the surgery of war wounds of the head the lessons in anæsthesia and operative technique learned in neurological surgery in civil life.

In civil work the problem is usually how to get access, without shock or sepsis and with a minimum of cerebral destruction, to some region of the brain affected by a pathological condition which has taken some appreciable time to develop. In military work the problem is how to save a patient who in an instant has had his scalp lacerated, his skull splintered and laid open, a part of his brain removed, some more of his brain pulped and liquefied, all these zones already infected with in-driven septic contaminants, and possibly a mass of metal, hair and other foreign matter embedded in the brain.

In this type of case there is no necessity for the long-drawn-out operations which have come to be the accepted thing in neurosurgery. All the essentials can be carried out promptly and effectively in a short space of time. First, the whole head must be soft-soaped and shaved. Clipping makes a mess of cut hair that is difficult to remove from the rest of the scalp and from the wound. A careful inspection of the whole head is then made, for I have on many occasions seen a large compound fracture with exposed brain mistaken for a wound of entry of a shell fragment, when as a fact it was the explosive exit wound of a perforating through-and-through wound made by a missile which had made a hardly recognizable small wound of entry. Having secured anæsthesia by injection of procaine, one proceeds to enlarge the scalp wound, for one always finds rubbish and hair under the edges of the scalp. As a general rule, the triradiate incision is the best. The edges are excised, and then one excises the contaminated bone edge. The best way to do this is by making holes with a perforator and burr near an edge of the bone and nibbling along parallel to the edge with a suitable skull forceps.

Osteoplastic flaps, with rare exceptions, are unsuitable in the presence of sepsis, and the extensive removal of large flakes of skull is unnecessary and bad.

A long, contaminated fissure in the skull should be followed up by a scalp incision, a hole should be bored with a perforator through the skull at the end of the fissure, and then the fissure should be converted into a long narrow gap by rongeur forceps. Otherwise infection will extend into the blood lying under the fissure and later cause an extradural abscess to form.

The brain is cleaned to a limited extent, first by the removal of obvious foreign material; then with a sucker and rubber catheter the liquid pulped brain is sucked out along the track of the missile. On no account syringe the wound. If mechanical cleansing is to be aided, saline solution may be dropped onto the wound while suction is maintained. If the patient is asked to cough, this act may help to expel pulped brain and debris. Brain matter

has a not inconsiderable capacity for resisting and overcoming infection; but if the ventricular system is opened to infection, the infection spreads and a fatal result is to be expected. It may be that in this war some of these casualties will be saved by the early and vigorous use of some of the sulphonamides.

Infection is apt to be worst at the surface and to become less in the depths of the brain. If the missile cannot be removed with ease, the surgeon should not lacerate the brain further and inflict further neural and vascular injury. The missile may be encapsuled later, or may initiate an abscess which can be dealt with when it arises.

It is still not sufficiently realized that post-traumatic epilepsy is due to deprivation of brain, destroyed at the instant of injury and later by sepsis, and not to irritation of the consequent scar or to the irritation caused by depressed bone or a foreign body on the remaining normal brain.

The dura should not be widely excised. The scalp is closed with the insertion of rubber tissue drains placed near the extremities of the excisions and not at the centre.

When preliminary inspection shows that a wound or fracture may have extended so as to tear a sinus, be prepared for this when operating. The blood loss is tremendous if not quickly controlled. Therefore prepare some plates of hammered-out temporal muscle to stick promptly on a slit in a sinus if this is encountered at operation.

Operate with the head elevated, with unimpeded respiration and if necessary with an extra supply of oxygen to be breathed if the patient becomes slightly cyanosed.

The quickest method of exposure of the sinus tear as a rule will be by quick use of a strong nibbling forceps. If the sinus is torn right across, nothing but complete ligature of each end will suffce. Silk or linen will hold better than catgut.

Patients with head injuries are a source of trouble in their disposal after operation. Like patients with abdominal and severe chest wounds, they bear transport badly. It is desirable that they should be retained for ten days at the army medical unit where the operation took place. This is, of course, not always practicable when wounded keep coming in day after day in large numbers.

Spinal Cord Injuries.

Injuries to the spinal cord very rarely justify operation for the cord injury. As in head injuries, the damage to the all-important nervous tissue is done at the instant of the wound infliction, so that very rarely is the removal of an in-driven missile or a laminectomy likely to lead to restoration of function. The men who recover after such operations have generally been affected by functional paralysis due to concussion and would have recovered as well or better without operation. The pressing surgical problem in these cases is the relief of bladder distension in transport, and incidentally the attempt to diminsh the risk of urinary tract infection.

Catheterization during transport in a succession of army medical units is likely to be followed quickly by infection. Dribbling of overflow leads to renal failure or ruptured bladder. In my own observation, the least deplorable results were obtained by a very small stab incision made in the skin in the suprapubic region, followed by the insertion of a big trocar and cannula and then by the passage through the cannula of a snugly-fitting self-retaining rubber catheter connected with a sealed siphon drain. We did not have sulphanilamide then; but I am sure the results will be better now with the aid of drugs of this class.

Injuries of the Face and Jaws.

Casualties with wounds of the face and jaws will generally be quickly passed on to specialist groups; but the general surgeon should prepare the way by cleaning wounds under anæsthesia as soon as possible, so that the specialist will be given a better chance of doing his work at an early stage without having to wait for the subsidence of extensive sepsis.

It goes without saying that there should be great conservatism about excision of facial skin. It has remarkable powers of recovery, and thorough washing with normal saline solution on pledgets of cotton wool and hæmostasis can bring about an orderly arrangement of cleaned structures which may be lightly sutured together in something approaching their normal anatomical positions.

Much can be done by the general surgeon to help in the early treatment of a fractured jaw. Fragments may be temporarily immobilized by the wiring of teeth of the lower jaw to those of the upper jaw, or of the contiguous teeth across a fracture of the lower jaw. When wire is not available, silk threads tied round the necks of the teeth can be tied to one another to bring about some stability till the wounded man can receive the best treatment from the oral surgeon.

Neck Wounds.

Wounds of the neck have their chief importance in respect to vascular surgery, though some neck wounds may be important from the injury inflicted on the respiratory or the alimentary passages. It is safer to open these neck wounds and to leave them open while there is a risk that cellulitis will spread. Cellulitis spreading from a septic wound in the neck may reach the mediastinum and cause death; but if it is able to discharge through an open wound, it may not extend downwards.

Even small missiles may produce grave vascular damage in the neck, and one should always be prepared for a sudden hæmorrhage from a large vessel when treating a wound in the neck. This specially applies to shell wounds in the lower part of the neck.

Carefully inspect the situation of the wound and, if practicable, have an X-ray examination for foreign body made before taking the patient to the operation room. Stand by, washed up and with some large artery forceps to hand, while the patient is being anæsthetized, for in his struggle he may dislodge a foreign body plugging a severed vessel or in some other way start a huge gush of blood from a large injured vessel, and the surgeon should be ready to pounce on the wound if this gush starts. Death takes place in about thirty seconds if a large artery near the trunk is completely severed. It seems incredible that a wounded man should survive to reach a casualty clearing station with a roughly severed subclavian or common carotid artery; yet this happened sufficiently often to make it necessary to be prepared for it. The wounds are temporarily sealed, but easily give way if disturbed. There are few hæmorrhages that cannot be temporarily stopped by the surgeon's finger promptly applied to the bleeding vessel and kept there; surgical art is required to put something on in place of the finger. I think it is a good plan, once you have your finger on a severed vessel, not to take it off while you try to perform some operative sleight of hand in a rapid attempt to grasp the bleeding end with a forceps. Keep your finger in place, if possible slip the artery forceps with your other hand down to the structure at your finger tip. Close the artery forceps on it, but do not take your finger off. Ask another surgeon to expose what is along the course of the artery forceps and not till a ligature is placed on what the finger is compressing should the life-saving finger be removed.

Unless you have attempted it, you will be surprised how quickly an index finger becomes tired by making steady digital pressure on a bleeding large vessel.

In wounds apparently made by small missiles, yet causing a large hæmatoma, be on the watch for arterial tears which will cause false aneurysm or arterio-venous aneurysm. It is desirable to open up the wound early and stop their formation. These are dreadful cases for operation at a later period. A bullet may pass between the common carotid artery and the jugular vein without wounding either, but a small fragment of shell or bomb may slice a hole in either or both.

It is hardly necessary to remind you that wounds at the root of the neck need care in their exploration, lest the cervical pleura be inadvertently opened; but it is not so often remembered that the cervical pleura may be opened by missiles that have entered at distances apparently anatomically remote from the pleura.

Wounds of the Chest.

I do not know what proportion of wounds inflicted in battle involve the chest. I should imagine it is high, and certainly a large number are quickly fatal, for a large missile wounding the heart or great vessels would soon cause death. Therefore the survivors reaching an advanced surgical unit are in a sense selected patients with the wounds chiefly involving pleura or lung. Of course, there are a few with mediastinal and cardiac injuries; these need not be denied operation, but their prospect is bad, not so much on anatomical grounds as from the risk that they will succumb later to sepsis.

As I have already stated, a thoracic injury may be caused by a missile entering through the neck. The missile may enter even more remotely, through the abdominal wall or even from the buttock. Nothing is anatomically too fantastic to be possible in military surgery.

Patients with chest injuries are often in a very distressed condition when they are first brought to the surgeon. In addition to shock and hæmorrhage, they often have severe dyspnœa.

If there is an open wound in the chest wall sucking in cold air and expelling it with blood, this must have immediate attention. After quick attention to any intercostal arterial bleeding, the wound should be quickly sewn up without an anæsthetic, or if it is too wide for this it should be plugged with a dumb-bell gauze pack. The patient should also be given an adequate dose of morphine and oxygen should be efficiently administered if possible. It is interesting to see such a patient later, still breathing rapidly, but not with distress. He is like a runner who has got his second wind, and his cardiac adjustment will now permit operation to be performed. The temporary sealing of the wound not only helps in the recovery from distressing dyspnœa; it also diminishes the chilling and shocking effect of cold air repeatedly sucked into the pleura.

Sepsis is the ever-present menace in chest wounds, and unfortunately it may become widely established before the patient has revived sufficiently to undergo operation.

Hæmorrhage may come from two chief sources, an intercostal vessel or a pulmonary vessel. A bullet wound or small bomb or shell fragment may cut an intercostal vessel, which will bleed very little externally but will bleed dangerously into the pleura. It is too often assumed that the bleeding into a hæmothorax comes from the lung. If it comes from an intercostal vessel it is of course amenable to direct attack. If the hæmorrhage comes from the lung, the bleeding vessel usually seals itself quickly unless the lung wound is a large one.

Establishment of pneumothorax is often effective in stopping hæmorrhage from a lacerated lung.

Operation is not required in every chest wound, but it should be performed in the following wounds: (*a*) lacerated wounds of the chest wall, (*b*) compound fractures of the ribs, (*c*) parietal bleeding, (*d*) persistent respiratory pain from a bone or foreign body scratching the pleura with respiratory movement, (*e*) an open sucking wound, (*f*) a wound in which the missile is a large piece of shell or bomb that is easy to reach.

No operation should be performed when the opposite lung is out of action. It may be collapsed through inspiration of blood clot into the bronchus, and of course one would not operate on a patient too shocked or exhausted to tolerate an operation.

Operation is not needed in most bullet wounds or in the presence of a clean hæmothorax.

When the lung is lacerated or has torn lappets, there need be no apprehension about cutting it cleanly and suturing it up. The pleura is more a source of danger than the lung, in that pleural sepsis is hard to prevent and is likely to be dangerous.

Do not operate solely with the idea of extracting the missile. If it is in the lung in an inaccessible position, even if it is large, it may be less dangerous to leave it *in situ* than to try to remove it. A missile may do little harm in the lung, but it is noxious in the pleural cavity.

As a general rule, the most useful deliberate exposure is along the fifth intercostal space. This can be opened widely by a spreader to give access to the pleura and lung. The primary wound when excised may give all the exposure needed.

In any case the chest must be closed at the end of the operation and pleural effusion dealt with as it arises later.

It was in these cases in which operation was performed for severe chest injuries that I first appreciated the great value of a blood transfusion as a routine measure at the end of the operation. Another valuable procedure was the routine examination, by X-ray screening on stated days, of all patients with chest wounds. Clinical signs are too often capable of misinterpretation. Seeing is believing, and seeing the inside of the chest by means of X rays is a necessary routine measure in the care of patients with chest wounds.

The choice of anæsthetic agent in chest surgery is often a matter of individual opinion. I think that everyone is agreed that ether is the least desirable. My own choice was for local anæsthesia, and if this was not sufficient, chloroform and oxygen.

I do not like nitrous oxide anæsthesia for a patient with a wounded lung; I think there is too much bleeding and the breathing movements are too violent.

I had no experience in high spinal anæsthesia in war surgery, and I do not think the satisfactory experience in civil operations on patients with unwounded lungs can be applied without reserve to the surgical treatment of the patient with a wounded lung who is already in a bad state from the effects of hæmorrhage, recent shock and acute dyspnœa.

The treatment of hæmothorax and post-operative effusion is much the same as that with which you are already familiar in civil surgery. Most effusions in a large hæmothorax can be slowly aspirated on the second or third day after its formation; but if the blood cannot be sucked through the needle wherever it is inserted, the clot must be removed by thoracotomy. It is not safe to leave it. As already stated, patients with severe chest wounds travel badly. If they have been operated on they must be retained for at least ten days. A patient who has not been operated on, and who is without respiratory distress and otherwise well, can be moved three days after being wounded.

When wounds affect the thorax there is always the chance that the missile has also wounded the abdominal contents. Careful examination before operation may lead one to suspect this; but the proof may not be present till the chest is opened and a hole is found in the diaphragm.

It may be possible to deal with the abdominal injury through an extension of the thoracic incision; but generally it will be more expeditious to deal with the abdominal contents through an abdominal incision. The diaphragm may be torn without injury to abdominal viscera, and it can be sewn up properly through the thoracic wound so as to prevent later herniation of abdominal viscera into the pleura.

My own observation led me to look with great disfavour on any form of irrigation of the pleura at any time, whether at operation or later, when the pleura was the site of septic infection. I think I saw good results of local cleaning of the pleura at the end of operation by cotton wool swabs wet with ether. (One would hope for better results now with the help of sulphanilamide, in greatly diminishing pleural sepsis; but in a few observations recently made in civil surgery this hope has not been altogether fulfilled.)

In purulent pleural effusion, so-called closed drainage with adequate negative pressure may be used in suitable cases if the patient can be kept in one medical unit for a sufficiently long time. The method needs close personal attention, for which it is not easy to find time when fresh casualties are coming in large numbers, and it is not suitable for patients who may be a considerable time in transit. Furthermore, the fact that the chest already has a hole in it makes the number suitable for this treatment comparatively small.

Apart from wounds entering the pleural cavity, there are dangerous wounds affecting the parietes. Shell wounds passing through the scapula and opening up the subscapular tissue to infection had a specially evil reputation.

A war wound of any large cellular plane is always dangerous, and the cellular plane between the *latissimus dorsi* and body, the plane between scapula and *serratus magnus*, and the plane between *serratus magnus* and body are highly dangerous sites for infection. The infections were generally of a mixed nature and only too frequently anaerobic infection took place with rapidly disastrous results. The amount of fluid poured out from these wounds was surprisingly large, and at times led to the idea that the pleura must have been opened.

Shell wounds of the pectoral region may also open into the pectoral fascial planes, producing frightful sepsis. Here again the outpouring of fluid may raise the suspicion that the pleura has been opened and is discharging foul fluid.

Wounds of the Buttocks.

Buttock wounds, besides being wounds in which large muscle masses and cellular planes are infected, carry an extra risk from the chance of injury to the great gluteal vessels. Anatomically, this is a horrible place in which to receive a shell wound. The great gluteal muscles very readily become the site of gas gangrene, and it is a formidable and generally a hopeless task completely to excise the infected muscle; nothing short of complete excision is worth while from an operative standpoint.

The great ilio-tibial band and the gluteal aponeurosis do not allow inflammatory swelling, and this of course has an unfavourable influence on the progress of these wounds. The gluteal arteries and their branches are large and numerous, so it is not to be wondered at that large hæmorrhages, primary and secondary, can take place in this region. The concealed hæmorrhage in the buttock can reach a tremendous size.

It is a difficult job getting down to the bleeding spot. It lies at a great depth, and to reach it the surgeon has to go through great bleeding muscle masses. The field of view is constantly being occluded by blood welling up from the originally severed vessel and by blood coming from veins and arteries divided by the surgeon in his approach to the site of damage.

If the main vessel is divided just as it emerges from the pelvis into the buttock, the task of occluding the vessel is very difficult. A long forceps may be clamped onto the bleeding point temporarily stopped by finger pressure. There is, of course, great danger of injuring one of the gluteal or sciatic nerves in doing this.

To turn the patient over and tie the internal iliac artery and vein may help to make the task of finding, isolating and ligating the bleeding vessel less difficult; but I would insist on the necessity of securing the injured vessel as the essential act and on the fallacy of relying on ligature of a main vessel as the sole means of effectively stopping bleeding from a wound of one of its branches.

After ligature of the internal iliac artery or of the gluteal or sciatic arteries, the resulting ischæmia increases the risk of gas gangrene in a region where the risk of its occurrence is already great. Excision of all the infected muscle mass is rarely feasible. Gas-gangrene antiserum by itself is rarely effective. Experience will show whether its use combined with administration of sulphanilamide will lower the mortality rate.

Abdominal Wounds.

A tremendous amount could be said about the treatment of patients afflicted by abdominal wounds, and it is obvious that I must confine my remarks to selected features.

The abdomen may appear to have been perforated by a missile, but later investigation may show that the missile has run around the abdominal parietes without opening the peritoneum. On the other hand, a wound apparently remote from the abdomen may represent the entry wound of a missile that does fatal injury to the peritoneal contents.

There is no doubt that, as a general rule, the earlier a patient can be revived to an operable condition, and the earlier that operation is then carried out, the better the chance of recovery. It must not be forgotten, however, that operation does not provide the only chance of recovery for a man shot through the abdomen. When collection had been delayed, when revival was very slow, when for other reasons a wounded man missed his chance of timely operation, the surgeon had perforce to treat patients already suffering from extensive peritonitis. Most of these died; but some survived who were kept deeply under the influence of morpine, warmed and supplied with fluid by routes other than the mouth. If we had possessed Miller Abbott tubes or even fine stomach tubes, we might have saved a few more. (It will be interesting here also to see the value of gas-gangrene antiserum and sulphanilamide in lowering the mortality rate.)

Blood transfusion was shown to be a procedure of astonishing value in rapidly bringing a patient with an abdominal wound into a state of fitness for operation, and the routine use of blood transfusion after operation, even though the patient did not seem to need it for anæmia, had a decided effect in lowering the mortality rate and in improving convalescence.

There is no doubt that the patient with a retained missile should be subjected to X-ray examination before operation; but caution is needed to see that this is not productive of chilling or shock. It was not at all uncommon to see a soldier, shot in the abdomen, who had been brought up to a stage of operability, relapse into a state of collapse or shock after being subjected to X-ray examination. It did not seem to be a matter always of rough handling or undue exposure.

The planning of the incision or incisions takes some thought. It is desirable that the wound of entry shall be surgically cleaned by excision, and this in itself may determine the site of the main opening into the abdomen. This may need to be combined with a regularly planned opening of the abdominal wall. In view of the fact that nearly all these wounds will of necessity be contaminated before, during and perhaps after operation, it is not surprising that post-operative infection of the wound was common. For this reason mid-line incisions are likely to cause trouble after operation. A septic mid-line wound and a blown-up abdomen make a combination predisposing to post-operative disruption of the abdominal wall. Muscle-splitting incisions and rectus retraction incisions on the whole are better.

To smear the wound surfaces with "B.I.P.P." and use interrupted sutures helped to diminish troubles from wound sepsis. Silkworm gut sutures were more likely to cut through a septic wound than stout silk which had been waxed and rubbed with "B.I.P.P." These large-tension sutures should be tied with stout rubber tubing guards to prevent skin being cut through quickly, and they should be left uncut for at least ten days and often much longer if there is much risk of wound disruption.

During the course of operation mechanical retractors giving good exposure and avoiding the irritations of hand retraction facilitate the essential technical parts of the operation.

The treatment of the soiled peritoneum was never a matter of agreement. The majority of military surgeons favoured as little disturbance of the peritoneum as possible; suction and localized swabbing were relied upon to effect gross cleanness and the natural powers of the peritoneum were relied upon to cope with microscopic soiling. And yet, right to the end of the last war, there were a few surgeons who claimed that they had achieved good results by swilling out the peritoneum with large quantities of saline solution or even with dilute solutions of antiseptics like flavine.

Primary drainage was a senseless procedure unless there was something left in the abdominal cavity to drain, and it was rarely that adequate drainage compensated for inadequate surgical measures. There can be no doubt that it is a bad thing to put a drainage tube in the neighbourhood of sutured bowel or stomach. It is a potent method of producing a breakdown of the suture line and subsequent peritonitis, or at the best a fistula.

Of course, the surgeon must always keep in mind the possibility that one missile may make multiple injuries in

the abdomen, and his surgical treatment is not complete if he attacks only the obvious lesions. Specially must this care be observed in the treatment of perforated bowel. It is a great mistake to waste time suturing perforations or resecting a length of bowel, only to find that this procedure is rendered useless or dangerous by a perforation or severance at another level discovered after the first work has been completed.

Endeavour early to sum up the extent of the intra-abdominal wreckage and be quickly radical in your surgery rather than ploddingly slow in a multiplicity of conservative procedures which are cumulatively exhausting to the patient.

The liver is a bad site for even a small shell wound. At first the patient may seem to have escaped with nothing more than some intraperitoneal hæmorrhage; but if septic clothing has been carried into the substance of the liver, he will suddenly become very ill shortly after operation with signs that will at first sight appear to be those of concealed hæmorrhage. His pulse rate rises and the pulse becomes small, he becomes rapidly pale, restless and breathless. He sweats and vomits, the abdomen becomes distended and he may lose his liver dulness. At first this looks like a concealed hæmorrhage; but the initiated will recognize it as evidence of quickly fatal "gas gangrene" in the liver.

The infection spreads with frightful rapidity, the hæmolysis is extraordinarily rapid and in a startlingly short period after death the whole body is unrecognizable from its gaseous putrefaction.

Colon wounds are notoriously bad for the risk they bring of peritonitis following injury. Interrupted sutures of silk are safest for closing the wound, and they should be covered over by a peritoneal layer of sutures. A caecostomy or colostomy opening above the laceration is an added safety factor at the close of the operation. A colostomy may also be used as a help in diminishing fæcal soiling of cellular areas in wounds involving the rectum.

When hasty surgical measures are inevitable, a single layer of suture of the Connell type may suffice to close a tear in the bowel, or even to anastomose severed ends. It is not a practice to be recommended as a routine measure, but in case of necessity it may be efficient.

Wounds of the bladder may involve the peritoneal portion or may be confined to a non-peritoneal part of the wall. The former is usually suspected either from the site of the wound or from the peritonitis symptoms and is therefore usually looked for early by operation. The extraperitoneal wound may escape early notice if the wound takes place by a missile having a remote entry in buttock, perineum or thigh. Dangerous extraperitoneal extravasation may have taken place before the wounding of the bladder is suspected.

After the tear in the bladder has been sewn up, it is a safe course to drain the bladder through a suprapubic drain. It is less likely to become blocked and cause further extravasation than is an indwelling catheter.

Anæsthetic agents for abdominal wounds need some consideration. When all are considered, ether is the safest and most satisfactory. The Clover and Probyn Williams's ether inhalers have become things of the past; but I had the experience of some excellent anæsthesia, good for the patient and good for the surgeon, conducted by an anæsthetist who knew his work with this apparatus. I also had very satisfactory experience with chloroform given by anæsthetists who were experienced in its use. I think it is unsafe in the hands of the inexperienced, and it is not a good anæsthetic for starved, exhausted patients or for those whose wounds are septic.

Nitrous oxide anæsthesia is sometimes useful for a shocked patient when the operative field is limited; but generally the abdominal muscles are too stiff if extensive exploration is needed, and often in military work the abdominal exploration must be wide to be thorough.

Local anæsthesia is too limited in its scope.

Spinal anæsthesia is not suitable for a weak, exhausted patient, and I think it is undesirable for a patient with perforated bowels, as the spinal anæsthetic leads to movement and contraction of the intestine with some further soiling of the peritoneal cavity.

To give ether on an open mask in cold weather with icicles all around the gauze is a fairly sure method of causing post-operative pneumonia. Post-operative pneumonia is as much an operative complication as peritonitis, technically less difficult to avoid, but accounting for a high proportion of deaths after abdominal wounds.

Ether given intratracheally by a proper machine, or ether given by the Shipway apparatus, gave less trouble than ether given by the open method, both at and after operation.

Most of the operative procedures take too long to be comfortably possible with anæsthesia induced by intravenous medication.

The treatment after operation is much the same as in civil work. There are a few observations I should like to make. The first is that military necessity may lead to the early transport to another hospital unit of patients who have undergone operations, and there is no doubt patients with abdominal injuries carry badly. It is better to select those with wounded limbs for transfer and to keep those with abdominal injuries till the very latest possible necessity.

Another feature is the septic condition that develops later in a large number of wounds of the abdominal wall. This has already been referred to, and I would again reiterate the caution about the risk of too early removal of tension sutures.

Give morphine freely, use the stomach or intestinal tube early, give fluid by every available route and do not worry about absence of bowel action.

It is necessary to keep a close watch to see that a patient with a wounded intestine is not given an aperient or an enema according to routine. There is much routine work in military life, and unless you are careful to prohibit it, you will find that a patient who has just been holding his own with peritonitis is quickly done to death by a purgative given without your having ordered it.

An enema given to a patient with a colon injury will burst through into the peritoneum and kill him quickly. As you may not have the opportunity to supervise the after-treatment throughout the whole twenty-four hours, it is a good plan to have these prohibitions printed in block letters on a label tied onto the patient's wrist or attached to his bed.

GAS TENSIONS IN THE TISSUES IN PATHOLOGICAL CONDITIONS.

By ERIC W. SIBREE.

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Pathological Changes in Respiration.

IT has been shown[(30)] that hyperventilation of the lungs causes a pronounced fall of carbon dioxide tension and a small rise of oxygen tension in the tissues. Apnœa produces the opposite effects. Injections of morphine in rabbits cause a rise of carbon dioxide tension in the tissues, sometimes preceded by a temporary fall; the oxygen tension also rises, sometimes greatly in subcutaneous tissues. As with the response to most stimuli, the effects show some variability unless very large doses are used. Campbell[(2)] found that anæsthetics increased the carbon dioxide tension in alveolar air and subcutaneous tissues. "Amytal", urethane and chloroform caused[(9)] usually a rise of carbon dioxide tension in the tissues and a fall of oxygen tension. Ether caused usually a rise of carbon dioxide tension in the tissues, but the oxygen tension was also raised slightly.

The effects of morphine and anæsthetics on the gas tensions in the tissues are, no doubt, largely an indication of the effect of these drugs on the respiration.

[1] Work done with the aid of a grant from the National Health and Medical Research Council.

Seevers[15] published findings on the gas tensions in the subcutaneous tissues of five normal subjects with averages of 45 millimetres of mercury for carbon dioxide tension and 22 millimetres of mercury for oxygen tension. Later, in a preliminary report[16] published by Seevers, Hathaway and Stormont on the subcutaneous gas tensions in pathological conditions, a few cases of respiratory disturbance were mentioned. A patient suffering from an acute attack of asthma showed subcutaneous gas tensions of 79 millimetres of mercury for carbon dioxide and 15 millimetres of mercury for oxygen. In a case of emphysema with cardiac decompensation, the subcutaneous carbon dioxide tension was 84 millimetres of mercury and oxygen tension was 14 millimetres of mercury. An interesting case is the one reported in which the subcutaneous carbon dioxide tension fell from 65 to 48 millimetres of mercury and the oxygen tension rose from 8 to 19 millimetres of mercury after relief by thyreoidectomy of tracheal obstruction from a carcinoma of the thyreoid.

In the present investigations, abnormally high subcutaneous carbon dioxide tensions were noted in one case of œdema of the lungs (as high as 76 millimetres of mercury) and in two cases of asthma (for example, 68 millimetres of mercury in a mild attack) and in one case of chronic bronchitis with emphysema (72 millimetres of mercury), although in cases of uncomplicated bronchitis the subcutaneous carbon dioxide tensions were normal. The range of averages of subcutaneous carbon dioxide tension in normal subjects was found to be 41 to 53 millimetres of mercury. Compared with the range of averages of subcutaneous oxygen tension in normal subjects (8 to 26 millimetres of mercury), the oxygen tensions in the respiratory conditions mentioned were normal (12 to 24 millimetres of mercury). In the three cases for which subcutaneous carbon dioxide tensions were given above, estimations were repeated when the subjects' clinical condition had improved. The subcutaneous carbon dioxide tension in each case fell to between 50 and 55 millimetres of mercury—that is, to the upper limit of the normal range. The subcutaneous oxygen tensions, however, showed little change. In only one case (asthma) was there an appreciable increase in oxygen tension, from 12 to 20 millimetres of mercury.

The changes noted in the tissues are no doubt a reflection of the changes in alveolar, arterial and capillary gas tensions, as in physiological alterations of respiration.[20] Meakins and Davies[11] found no changes in arterial blood gases in uncomplicated bronchitis, but they found a rise in carbon dioxide content and a fall in oxygen content in emphysema and advanced pulmonary tuberculosis. Unfortunately, reliable estimations of alveolar air and of venous carbon dioxide tensions could not be made on the subjects mentioned above because of their inability to cooperate efficiently.

The slightness or lack of alteration of oxygen tension in the tissues when there are pronounced changes in carbon dioxide tension may be explained. Alterations in the gas tensions of arterial blood affect the tissues only in so far as they affect average capillary gas tensions to which the tissues are exposed. It has been indicated[20] that average capillary gas tensions are close to those of venous blood. Since arterial carbon dioxide tension is normally only a few millimetres of mercury lower than the carbon dioxide tension in venous and average capillary blood, an increase in arterial carbon dioxide tension will increase the average capillary carbon dioxide tension to almost the same degree. On the other hand, normal arterial oxygen tension is much greater than average capillary oxygen tension, and a fall in arterial oxygen tension will cause only a slight decrease in average capillary oxygen tension. Further, similar decreases of oxygen saturation will cause far less fall of oxygen tension in average capillary blood (being nearly venous) than in arterial blood, because of the shape of the oxygen dissociation curve of blood. This effect is very similar to the slight rise of average capillary oxygen tension shown to occur when high percentages of oxygen are breathed.[20]

Pathological Changes in Circulation.

F. Meyer investigated gas tensions in the subcutaneous tissues of normal subjects and of patients with circulatory disturbances. In the earliest article[13] figures were given for normal human subjects with average subcutaneous gas tensions of 41 millimetres of mercury for carbon dioxide and 54·5 millimetres of mercury for oxygen, the corresponding arterial tensions being 40·0 millimetres of mercury and 79 millimetres of mercury respectively. In the second article,[12] average subcutaneous gas tensions in normal subjects are given as 41 millimetres of mercury for carbon dioxide as before, but 37 millimetres of mercury for oxygen. The figure of 41 millimetres of mercury for carbon dioxide tension is appreciably lower than the figures given by later investigators (45 millimetres of mercury[15] and 48 millimetres of mercury[19]), and even the lower of Meyer's averages for oxygen tension (37 millimetres of mercury) is much higher than later findings (22 millimetres of mercury[15] and 16 millimetres of mercury[19]). As shown previously,[19] most errors of estimation of gas tensions in the tissues by the gas depot method give low carbon dioxide tensions and high oxygen tensions, so that Meyer's findings are, with little doubt, inaccurate. It is almost certain, therefore, that Meyer's findings in cases of circulatory disturbance[12][14] are also inaccurate; but the direction of changes of oxygen tension indicated is of interest, although the extent of changes is undoubtedly exaggerated. Of 33 cases of circulatory disturbance of various types,[12] in all except one the subcutaneous oxygen tensions were between 20 and 29 millimetres of mercury, compared with 54·5 millimetres of mercury for normal subjects (later given as 37 millimetres of mercury[19]). Carbon dioxide tensions are not given in this series; but in a later series[14] carbon dioxide tensions as high as 56 millimetres of mercury with oxygen tensions as low as 11 millimetres of mercury were found. Possibly the technique of investigation had been improved.[1]

In the present investigations satisfactory estimations of gas tensions in subcutaneous tissues were made on four subjects with circulatory disturbance. Two subjects showed signs of pronounced congestive failure, with œdema of the legs, enlarged liver, slight cyanosis of the lips, and dyspnœa at rest. The other two were patients suffering from aortic regurgitation and hypertensive arteriosclerosis respectively, dyspnœic on slight exertion, but not showing congestive failure of circulation.

The two patients with congestive failure showed high subcutaneous carbon dioxide tensions—68 and 72 millimetres of mercury—and subcutaneous oxygen tensions of 19 and 16 millimetres of mercury respectively. The patients without congestive failure showed subcutaneous carbon dioxide tensions of 52 and 58 millimetres of mercury and oxygen tensions of 19 and 14 millimetres of mercury. Average subcutaneous carbon dioxide tensions in normal subjects were found to vary from 41 to 53 millimetres of mercury, and average oxygen tensions from 8 to 26 millimetres of mercury.[19] Average subcutaneous carbon dioxide tensions of 58, 68 and 72 millimetres of mercury are thus above normal, and the figure of 52 millimetres of mercury is at the upper end of normal range. All the average oxygen tensions in the subjects with circulatory disturbance were within normal limits, and close to the average figure of 16 millimetres of mercury found for the series of normals. Thus, while carbon dioxide tension in subcutaneous tissues appears to be raised in cases of circulatory disturbance, particularly with congestive failure, the oxygen tension at rest is about normal. In view of the wide range of normal variations from time to time and from individual to individual, only general conclusions are permissible. The estimation of gas tensions in alveolar air and venous blood was unreliable in these patients, owing to dyspnœa. Meakins and Davies[11] found that in circulatory failure with venous congestion there were an increased carbon dioxide con-

[1] Meyer[13][12] attempted to analyse the causes of lowered oxygen tension in the tissues in cases of circulatory disturbances in terms of disturbances of blood circulation and of changes in the blood and in pulmonary epithelium.

tent and a decreased oxygen content in arterial blood, due probably to accompanying pulmonary congestion. Circulatory disturbances without venous congestion did not cause a rise in arterial carbon dioxide content, but usually a fall.

Explanation of the observed changes in gas tensions in the tissues in pathological conditions of the circulation may be made on similar lines to that suggested in respiratory conditions. Although the origin of the changes may differ, the effects on the gas tensions of arterial blood, capillary blood and tissues are very similar.

Anæmia.

Campbell[6] found that the hæmoglobin percentage in blood of normal rabbits varied greatly (from 94% to 46%), although the gas tensions in the tissues were much the same. Campbell[6][8] studied the effects on gas tensions in the tissues of rabbits of experimental alterations in hæmoglobin percentage. The functioning hæmoglobin percentage was lowered by the breathing of carbon monoxide for about a week or by the injection of hæmolysing serum or by bleeding. Hæmolysis caused slightly greater effects on the tissues than did bleeding.[8] The breathing of carbon monoxide caused greater effects than did hæmolysis or bleeding for the same loss of functioning hæmoglobin.[7] Anæmia from hæmolysis or bleeding, and the loss of functioning hæmoglobin from the breathing of carbon monoxide, caused the same effects on gas tensions in the tissues as the breathing of low oxygen percentages—that is, a fall in oxygen tension and carbon dioxide tension in the tissues. Campbell found that it was impossible, however, even by a loss of 70% of hæmoglobin, to lower the oxygen tension in the tissues below 40% of the normal value for more than short periods without risk of death. The changes in gas tensions in the tissues were delayed for some days after the reduction of hæmoglobin percentage.

Campbell also found that the raising of the hæmoglobin percentage by as much as 60% of normal by injections of blood or by previous long exposure to low percentages of oxygen caused an increase in oxygen tension in the tissues of up to 25% or more, together with a decrease of carbon dioxide tension. These effects were not produced for five or six days. The fall of carbon dioxide tension was attributed to the action of hæmoglobin as an acid.

The experimental changes in hæmoglobin percentage produced by Campbell[6] in rabbits were very great. The bleeding experiments reduced hæmoglobin from an average normal of 68% to an average in anæmia of 21%. Compared with an average normal of 100% in human subjects, this would correspond to a drop to 31% of hæmoglobin, an extreme anæmia. Similarly the injection of blood caused a rise of hæmoglobin from an average normal of 67% to an average of 107%, corresponding to a rise from 100% to 160% hæmoglobin in human subjects. A fall in hæmoglobin of about 70% caused a drop in oxygen tension in the tissues of 30% to 40% and a drop of 10% to 20% in carbon dioxide tension in three days. A rise in hæmoglobin of about 60% caused a rise in oxygen tension in the tissues of about 20%, and a drop in carbon dioxide tension of about 7% in five or six days. Owing to the great amount of daily variation in gas tensions in the tissues,[18] changes of 20% or less over a period of several days are of doubtful significance. The fall of 30% to 40% in oxygen tension in the tissues in extreme degrees of anæmia is of interest.

In the present series it was found that the bleeding of rabbits sufficient to cause a drop in the hæmoglobin in the blood of up to 50% of the normal made no appreciable alteration in the gas tensions in the tissues over several days. Variations noted in the experiments were irregular and similar to normal variations.

Observations were made on subcutaneous gas tensions in ten patients suffering from anæmia. The findings are shown in Table I.

Comparison of the average figures for gas tensions in the tissues for anæmic subjects and normal subjects shows that they are remarkably similar. The small differences cannot be regarded as definitely significant, since normal figures are so variable.[18] Certainly there is no appreciable lowering of subcutaneous oxygen tension in the subjects observed. There appear to be appreciable differences in the carbon dioxide tension of mixed venous blood and in the alveolar gas tensions. However, these differences may be due to the inability of most hospital patients to cooperate as efficiently as trained normal subjects in the experimental respiratory procedures. Meakins and Davies[11] found in anæmia no appreciable variations from normal in the oxygen and carbon dioxide saturations and tensions of arterial blood. Observations on the gas tensions of venous blood, as being more closely allied to capillary blood, would, however, be of more significance as regards the tissues than the gas tensions of arterial blood.

Patients I, VII and X were investigated again after treatment resulting in a return of hæmoglobin percentage to about 80 in each case. No alterations of more than three millimetres of mercury were found in the average gas tensions in the tissues and alveolar air nor in venous carbon dioxide tension, and these small changes were irregular.

Although Campbell found changes in the gas tensions in the tissues in rabbits with severe anæmia, there appears to be no appreciable change in gas tensions in the subcutaneous tissues, nor probably in alveolar air, nor in venous carbon dioxide tensions in anæmia in human subjects. If alterations do occur, they are probably of small degree and inconsistent.

Observations were made on the changes in the gas tensions in the tissues of a rabbit caused by exercise in a

TABLE I.

Gas Tensions in Tissues, in Venous Blood and in Alveolar Air.

Patient's Number.	Type of Anæmia.	Hæmoglobin Percentage.	Tissues.		Venous Carbon Dioxide. (Millimetres of Mercury.)	Alveolar Air.	
			Carbon Dioxide. (Millimetres of Mercury.)	Oxygen. (Millimetres of Mercury.)		Carbon Dioxide. (Millimetres of Mercury.)	Oxygen. (Millimetres of Mercury.)
I	Pernicious	38	50	22	44	34	114
II	Pernicious	50	52	21	46	39	108
III	Acholuric jaundice	33	36	15	36	33	120
IV	Acute melyoid leuchæmia	39	42	21	44	35	109
V	Gastric carcinoma	33	35	16	37	32	107
VI	Gastric carcinoma	60	44	21	42	35	110
VII	Hæmatemesis (peptic ulcer)	44	42	18	41	36	109
VIII	Hæmatemesis (peptic ulcer)	47	45	20	44	38	100
IX	Hæmatemesis (peptic ulcer)	51	52	13	48	39	111
X	Hæmatemesis (peptic ulcer)	49	53	14	46	40	101
Averages		44	45	18	43	36	109
Normal[18]		100	48	16	47	40	99

normal condition and during stages of anæmia down to 50% of normal hæmoglobin produced by bleeding. The rise of carbon dioxide tension in the tissues which occurred during exercise, and immediately after exercise in the subcutaneous tissues, was considerably exaggerated in anæmia. The carbon dioxide tension in the tissues in the recovery period fell to about the same level in normal and anæmic states. There was little change in subcutaneous oxygen tension during exercise in both normal and anæmic states, while in both states there was a slight fall in peritoneal oxygen tension. In both tissue sites, the rise of oxygen tension during the recovery period was less pronounced in anæmia. These results require confirmation. They suggest that anæmia causes a breakdown in the normal compensatory effects of the respiratory cycle in exercise.

Averages of 46 millimetres of mercury carbon dioxide tension and 27 millimetres of mercury oxygen tension were observed in one case of polycythæmia in which the hæmoglobin value was 119%. This oxygen tension is at the upper limit of normality.

Acidosis and Alkalosis.

Campbell[4] found that the intravenous injection of saline solution at a rate greater than five cubic centimetres per kilogram per hour caused a decrease of carbon dioxide tension in the tissues and a rise of oxygen tension. Intravenous injection of acid-producing substances,[4][8] such as ammonium chloride, also caused a decrease in carbon dioxide tension in the tissues and a rise in oxygen tension. Intravenous injections of sodium bicarbonate[3][8] caused pronounced rises of carbon dioxide tension and a pronounced fall of oxygen tension under the skin and to a less extent in the peritoneal cavity. Acidosis and alkalosis, produced by these methods, caused the same changes of carbon dioxide tension in alveolar air as in subcutaneous tissues in animals.[1][2] Meakins and Davies[11] found that only very severe uræmic acidosis lowered alveolar carbon dioxide tension; but they refer to the pronounced lowering of alveolar carbon dioxide tension in experiments by Haldane after ingestion of large quantities of ammonium chloride. The changes noted by Campbell in acidosis following the injection of acid-producing substances (a fall in carbon dioxide tension in alveolar air and tissues and a rise in oxygen tension in the tissues) were used by him to explain the similar changes in the tissues of rabbits after exercise. This does not explain, however, the reverse effects noted during exercise in rabbits.

In the present series it was noted that intravenous injections of 10 cubic centimetres of normal saline solution at body temperature in rabbits tended to cause a lowering of carbon dioxide tension in the tissues, as found by Campbell; but the effects were slight and inconstant, and there was no pronounced change in oxygen tension. Solutions of gum acacia in saline solution injected intravenously caused usually a pronounced lowering of carbon dioxide tension and slight increase of oxygen tension in the tissues. A fall in carbon dioxide tension in the tissues was noted after the intravenous injection of water, but there was no appreciable change in oxygen tension. Lactic acid (10 cubic centimetres of a 2% solution) was injected instead of the substances used by Campbell in an attempt to simulate the effects of physiological acidosis in exercise. No consistent changes were observed, and certainly no changes corresponding to those of exercise. The intravenous injection of 10 cubic centimetres of a 5% sodium bicarbonate solution caused slight falls in the carbon dioxide tension in the tissues, instead of a pronounced rise as found by Campbell, and the oxygen tension showed no appreciable change.

The experiments in which these observations were made were not sufficiently numerous to justify exact conclusions on the effects on the tissues of acidosis and alkalosis; but they throw considerable doubt on Campbell's findings, which require confirmation. If such changes as reported by Campbell do occur, the degree of acidosis or alkalosis necessary to produce them is probably much greater than will occur in physiological or in most pathological conditions. Comparison of the effects of experimental changes with physiological and pathological changes is difficult without some standard of judgement of the results, such as estimations of the hydrogen ion concentration of the blood and tissues.

Pathological Changes in Metabolism.

Campbell[3][8] found that an increase of metabolism in rabbits brought about by ingestion of thyreoid extract (1·3 grammes per day) for four weeks caused no change in gas tensions in the tissues, although pronounced loss of weight and increased food consumption occurred. Campbell also found[4] that thyreoparathyreoidectomy in rabbits caused little change in gas tensions in the tissues until tetany tremors appeared.

Observations were made in the present investigations on the gas tensions in the subcutaneous tissues of four patients suffering from thyreotoxicosis, with basal metabolic rates from 30% to 50% above normal. The average oxygen tensions (20 to 26 millimetres of mercury) were at the upper end of the normal range of averages (8 to 26 millimetres of mercury). The average carbon dioxide tensions (45 to 60 millimetres of mercury) were slightly above normal (41 to 53 millimetres of mercury). The number of cases was too small to justify any generalization.

The estimation of alveolar air tensions and venous carbon dioxide tensions was difficult because of the excitable condition of the subjects, and the results were therefore probably unreliable. In these estimations the carbon dioxide tensions of alveolar air and venous blood were low and alveolar oxygen tension was rather higher than normal. In one case satisfactory estimations of subcutaneous gas tensions were made when the thyreotoxic condition was pronounced (basal metabolic rate + 40%) and after treatment (basal metabolic rate + 5%). There was no appreciable change in the gas tensions in the tissues.

No satisfactory estimations of gas tensions in hypothyreoid subjects were obtained owing to the large amounts of fat in the subcutaneous tissues in such subjects.

It may be concluded that changes in general metabolism which occur slowly, as in thyreoid dysfunction, do not produce pronounced changes in the gas tensions in the tissues. Since changes in metabolism cause changes in the rate of carbon dioxide formation and oxygen consumption in the tissues, the tensions of these gases in the tissues must tend to alter; but this tendency will be compensated for by alterations in the respiratory cycle.

Infection and Inflammation.

Campbell[10] found that pathological fluids and tissues usually contained high percentages of carbon dioxide, and he suggested that pathological changes probably lowered the oxygen content of the tissues. He found[5] very low oxygen tension, two to three millimetres of mercury, in subcutaneous cellulitis, and concluded that low oxygen tension might occur in any infection of the tissues. From figures given on the gas tensions in gas from pneumothorax in cases of tuberculosis of the lung and pleura, he concluded[5] that the greater the infective process, the higher was the carbon dioxide tension and the lower the oxygen tension. Because of the high oxygen tension in the tissues during the period of reaction to an initial injection of gas, Campbell concluded[4] that local inflammation (that is, a sterile hyperæmia) might cause increased oxygen tension in the tissues.

Campbell's findings[3][7] of low oxygen tension in all parts of the alimentary tract except the stomach and of very high tensions of carbon dioxide, hydrogen and methane in the large intestine were due, no doubt, to bacterial action, as in the case of subcutaneous cellulitis. In the present investigations, after accidental injection of gas into a rabbit's intestine, samples were obtained showing carbon dioxide tensions as high as 145 millimetres of mercury and oxygen tensions down to zero.

Four rabbits which were under observation developed coccidiosis, an infection of the alimentary tract causing multiple infective foci in the liver. No changes in gas

tensions in the tissues were noted until about a day before death, when the carbon dioxide tension rose and the oxygen tension fell in subcutaneous and peritoneal tissues, although these tissues were not directly affected by the disease. Campbell noted[1] that when an animal was dying the carbon dioxide tension in the tissues rose greatly, continuing to rise after death. This finding was confirmed in the present investigations, and it was noted that the oxygen tension fell as the carbon dioxide tension rose. The post-mortem changes must have been due to bacterial action.

The observations mentioned indicate that bacterial action causes a local rise of carbon dioxide tension and a fall of oxygen tension. When the infective process is sufficient to endanger the life of the animal, similar changes in gas tensions throughout the body have been noted, but these may not supervene until the animal is moribund. Non-infective inflammation probably causes a pronounced increase in oxygen tension and a slight fall in carbon dioxide tension in the tissue concerned.

Oxygen Tension in the Tissues in Pathological Conditions.

In the pathological states examined there is little, if any, change in oxygen tension in the tissues. In any type of failure of the respiratory cycle, such as failure of respiration or of circulation, or of oxygen carriage by the blood, there must be a tendency to a fall of average capillary oxygen tension and therefore of oxygen tension in the tissues. The lack of pronounced change in the tissues is due to the nearly venous nature of capillary blood, and to the shape of the oxygen dissociation curve of blood, as previously mentioned. These two factors act as a buffer to the normal oxygen tension in the tissues. Such protection, however, cannot be maintained indefinitely in the face of continued failure of the respiratory cycle. Ultimately, the average oxygen tension in capillary blood must be much lowered, and the oxygen tension in the tissues similarly will fall in the attempt to maintain an adequate oxygen tension gradient. Theoretical considerations and experimental observations indicate that a considerable fall of oxygen tension in the tissues will not occur until death is imminent, as in histamine shock,[2][3] the onset of tetany,[4] the final stages of infective processes and severe anæmia in animals, also in œdema of the lungs, severe congestive failure of the circulation and tracheal obstruction[16] in human subjects. It is probable that anæmia in human subjects does not lower significantly the oxygen tension in the tissues at rest until the subject is *in extremis*.

General Conclusions on Gas Tensions in the Tissues.

The gas tensions measured by the gas depot method[2][3][5] are average extracellular tensions, which probably are close to the average gas tensions within the cells.[1] The general uniformity of these tensions is due probably to the perpetuation of the conditions in which unicellular organisms first developed, so that gas tensions in the tissues represent a fundamental normal condition of gaseous metabolism. Differences of gas tensions peculiar to different tissues may be due to differences in metabolic activity and corresponding states of local circulation. From time to time in the tissues of resting subjects there are considerable variations in the gas tensions, forming a normal range. There is no apparent reason why the carbon dioxide tension in the tissues of the respiratory centre should not undergo similar pronounced changes at rest.

The respiratory cycle is a compensatory mechanism, whose chief duty is to regulate capillary blood so that such conditions may be maintained as are suitable for varying degrees of tissue metabolism. The tissues are exposed intimately to the average gas tensions of capillary blood, which approximate to those of venous blood. The average carbon dioxide tension in the tissues is close to that in average capillary blood and venous blood. There is a definite oxygen tension gradient from capillary blood to the tissues, which represents a reserve mechanism whereby greater oxygen transference may be obtained by a slowing of the rate of capillary blood flow. Oxygen tension in normal human subcutaneous tissues at rest may fall nearly to zero or rise to about 30 millimetres of mercury. In more active tissues the oxygen tension is probably higher; but it is unlikely to be anywhere much greater than in mixed venous blood (about 40 millimetres of mercury).

The consideration of the relations of the tissues to capillary blood provides a key to the interpretation of changes which occur in physiological and pathological conditions. Modifying factors exist in the nearly venous nature of average capillary gas tensions and in the shape of the dissociation curves of blood for carbon dioxide and oxygen. A correlation of these factors indicates that changes in carbon dioxide tension in arterial blood will affect considerably the carbon dioxide tension in the tissues; but changes in arterial oxygen tension will have comparatively little effect on oxygen tension in the tissues. Changes in metabolic activity are compensated for by changes in the respiratory cycle, tending to maintain normal levels of gas tensions in the tissues.

Vague terms such as "oxygen deficiency in the tissues" and "oxygen want" have been correlated frequently with low oxygen tension in the tissues, with little regard for the relation of the factors concerned. In an earlier article[17] an analogy was made between alveolar air and tissue fluid, in which the term "gas reservoir" was used for lack of better description. The expression was unfortunate, because tissues and tissue fluid have no appreciable oxygen reserve. The tissues may be regarded primarily as the site of tissue metabolism requiring continuous gas transference, which is the essential factor in the relation of the tissues to the respiratory cycle. The gas tensions in the tissues are only one of the factors influencing gas transference, so that a change in oxygen tension in the tissues does not necessarily imply a similar change in the supply of oxygen nor a change in metabolic rate. An analogy may be made between the tension of a gas in the tissues and the depth of water in a river. Neither of these estimations indicates the volume of flow unless other factors are known. In physiological and pathological conditions there is usually an interplay of many factors, the analysis of which is difficult and frequently conjectural.

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Reports of Cases.

THREE CASES OF ABDOMINAL TUMOUR.

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DURING October, 1940, I operated on three patients whose abdomens were very large and each contained a tumour of different nature.

Case I.

A single woman, aged thirty-six years, would not give a connected history, as she was a Christian Scientist and was reluctant to say of what she complained. She admitted that she had not been well for three years and her medical attendant had diagnosed her condition as tuberculous peritonitis. Her menstrual history was normal.

Examination of her abdomen revealed a swelling quite the size of a large full-term gestation. A provisional diagnosis of ovarian cyst was made and operation was suggested. I subsequently heard from an ear, nose and throat specialist, who was once a general practitioner, that she consulted him, feeling that his opinion would be free from bias. He was amused enough to examine her abdomen, and gave it as his opinion that she had an ovarian cyst. She returned to me and said she was prepared for an operation.

A subumbilical incision was made in the mid-line. A hard tumour was found, and insinuating my hand below it, I discovered that it was a subperitoneal fibroid growing from the right cornu of the uterus. The incision was then enlarged above the umbilicus to a length of eight inches. With some difficulty the fibroid was extracted from the abdomen. After it had been removed the cornual wound was oversewn. The uterus was normal in size and so were both ovaries. The wound was closed in layers and healed well.

The convalescence was uneventful. The patient was out of bed on the eighteenth day and is now quite well. The fibroid weighed 22 pounds; this, I think, must be nearly a record for a single fibroid.

Case II.

A single girl, aged fifteen years, complained of pain in the right iliac region, and her mother thought she might have appendicitis. Her menstrual history was normal. Her abdomen was the size of a full-term gestation. An ovarian cyst was diagnosed and an X-ray examination revealed no fœtal parts. Operation was performed, and I removed a multilocular mucinous ovarian cyst. The cyst without the fluid weighed two pounds ten and a half ounces; surely this was very large for such a young patient.

Case III.

A *multipara*, aged thirty-eight years, asked me to attend her at her confinement. She brought with her a typewritten history of her case, which had been given to her by her doctor when she left Bristol, England. The history stated that her first pregnancy resulted in a *placenta prævia*, with the loss of the child. The second pregnancy ended normally, but the child was stillborn because of premature separation of the placenta. Next followed a miscarriage. The Wassermann test produced no reaction. The history, from her obstetrician, concluded with the following statement: "If she were remaining in England, a Cæsarean section would be considered next time." This the patient and her husband requested, because of her advancing age and the extreme desire to have a live baby.

Pregnancy was normal, and ten days before the probable date of normal confinement I performed a Cæsarean section with a very happy result. A live healthy baby, weighing seven pounds ten and a half ounces, was delivered. The placenta was low down on the anterior uterine wall and the child was in the left occipito-posterior position. I feel sure that any delay due to the position might have again caused premature separation of the placenta.

MEDICAL CURE OF PERINEPHRIC ABSCESS.

By H. ROSS MACOURT,
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Clinical Record.

H.M., a male patient, aged eighteen years, reported to me four days after he had been thrown against a fence by a horse. He complained of pain in the lumbar region. On examination he was very tender over the muscles of the left side of the back; there was no bruising or swelling to be seen. A liniment and salicylates were prescribed, a diagnosis of "strained muscles of the back" having been made. However, "pain on movement" and throbbing pain in this area at night steadily became worse.

Eight days after his first visit he became feverish and delirious, and suffered one short rigor, while the throbbing pain became most intense. He was then extremely tender in the left subcostal angle; there was pronounced fullness in this area, but no redness. His temperature was 101·6° F. and his pulse rate 120 per minute. There was no pus in the urine (nor was there at any future date).

He was admitted to hospital with the diagnosis of perinephric abscess and given one gramme of sulphanilamide every four hours. This treatment was continued for ten days, and later, after a rest period of seven days, one gramme of sulphanilamide was given three times a day for a further fourteen days.

For the first three days after his admission to hospital the temperature and pulse rate changed little, though the tenderness diminished. From the fourth day his condition steadily improved, though he still had occasional rises of temperature above 99° F., even after fourteen days of treatment. However, his temperature remained normal from the fifteenth day onwards. The swelling disappeared about the eighth day; deep tenderness remained until the fourteenth day.

He was allowed to sit in a chair on the twenty-first day, and was discharged from hospital four days later. For a further week he was not permitted to do any work; then he was allowed two weeks' light work, at the end of which, unknown to his physician, he rode thirty miles on horseback. He has now been back at his usual occupation (delivering ice and riding over "bumpy" roads in an old spring-cart) for over two months.

There has been no recurrence of symptoms or of tenderness. Apparently he has been completely cured.

Comment.

The interest in this case lies in (i) the onset, (ii) the result obtained with medical treatment, (iii) the speed with which this result was attained, and (iv) the short period which elapsed before the patient returned to fairly heavy work. I think that most readers will agree that such a short period of illness with such a rapid recovery to a state of "full working efficiency" is more than one could have expected with the usual method of treatment—namely, surgical drainage.

Reviews.

"ROSE AND CARLESS."

"ROSE AND CARLESS" continues its triumphant course. The sixteenth edition appears in the same two-volume form as its immediate predecessor, and its ease in handling, legibility and general format leave nothing to be desired.[1] A determined effort has been maintained to keep the book up to date, and a new chapter on war surgery testifies to this desire.

Certain criticisms of the fifteenth edition have been overcome. Peptic ulceration and its surgical treatment are now given the more generous treatment they deserved, while the treatment of appendicitis has been entirely rewritten and the unconventional views of the previous edition have been discarded.

Amongst the astonishing mass of information supplied to the reader certain omissions were noted. No account of post-operative symbiotic gangrene and its treatment could be found. Plasma transfusion was not considered in the treatment of shock, while the modern handling of cases of phlebitis was omitted. The student is not presented with a proper statement of the fluid requirements of the body, and the whole problem of fluid balance should be considered more carefully in a future edition. In the chapter on intestinal obstruction the importance of the internal fluid circulation (secretion and absorption) and its disruption is not stressed.

In many cases it is noticeable that additions to knowledge are placed as addenda to still-retained but outmoded views. As an example, a reader of the earlier pages of the chapter on neurological surgery would scarcely suspect its later excellence when he read, concerning methods of opening the skull, that "of late, however, some form of Wagner's osteoplastic method has been chiefly used. This procedure is a severe one, attended by considerable shock and hæmorrhage, and therefore may be undertaken as a preliminary measure a week or ten days before the lesion in the brain is attacked." The continued advocacy of subtemporal decompression in the treatment of severe cerebral trauma seems of doubtful wisdom.

Finally, the collation of the new knowledge concerning wound treatment offered by the abundant opportunities of the present conflict will certainly necessitate a revision of this chapter in the next edition.

But these are small points of suggestion rather than criticism, and detract nothing from the book's general excellence.

In our opinion Wakeley and Hunter have, in this and in the previous edition, built up a manual of surgery unrivalled in the English-speaking world.

THE ANATOMY OF THE EYE AND ORBIT.

IT is a simple matter to review Eugene Wolff's second edition of "The Anatomy of the Eye and Orbit".[2] It is quite the best book on the subject, not simply because its only rival is a rather antiquated translation of an Austrian work. One finds so many excellent qualities in this book that even if it had rivals one would expect them to fall short of it. This work is so admirable that the reader can afford to sit back and look for deficiencies. Amongst these is the failure of the author to keep up with the controversy regarding the formation of the intraocular fluid. The latest reference is to a report in 1931, and the origin of the aqueous has assumed several forms since then. Why not let us abandon the very inaccurate term *"ligamentum pectinatum iridis"*? It was originally used to describe a tissue that does not resemble any in man; it was found in a lower mammal that has no relationship to man. In this region of the eye no reference is made to Friedenwald's discovery of an arterial supply to Schlemm's canal. The surface anatomy of the *ora serrata* has assumed great importance in surgery and yet little of value is available in this book. It would be wise for the author to bring his references to the comparative anatomy of the retina up to date. He has relied on Hesse's and Bütschli's works, and ignored Kolmer and the more recent studies of Wells of America and of Kevin O'Day of Australia. With these suggestions and a criticism of the spelling of Türck's name, however, we recommend the ophthalmologist to keep such a volume in his library as an essential possession.

[1] "Rose and Carless' Manual of Surgery for Students and Practitioners", by C. P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E., F.R.S.A., F.A.C.S., F.R.A.C.S., and J. B. Hunter, M.Chir., F.R.C.S.; Sixteenth Edition (in two volumes); 1940. London: Baillière, Tindall and Cox. Royal 8vo, pp. 1,768, with 1,090 illustrations and 19 colour plates. Price: 30s. net.

[2] "The Anatomy of the Eye and Orbit, including the Central Connections, Development and Comparative Anatomy of the Visual Apparatus", by E. Wolff, M.B., B.S., F.R.C.S.; Second Edition; 1940. London: H. K. Lewis and Company Limited. Crown 4to, pp. 384, with 242 illustrations. Price: 31s. 6d. net.

NEUROSYPHILIS.

As he states in the introduction to "Neurosyphilis",[1] Worster-Drought intends his book to make good the comparative scarcity of recent monographs in English dealing specifically with syphilis of the nervous system.

There seems no doubt that this represents a worthy example of the work of English neurologists. The general set-up and presentation are satisfactory and concise, and the occasional repetition of facts are justified when the main aim of the book "to be useful to students and practitioners" is considered.

Stress is laid on the many points on which ignorance still exists—for example, of the nature of the spirochæte, the reason for the incidence of neurosyphilis in only a proportion of syphilitics, and the mechanism of cure by malarial therapy.

The work would be worth while if only one lesson were taught, namely, the danger of relying exclusively on a positive Wassermann reaction in the blood in the diagnosis of neurosyphilis. In "undoubted" cases of neurosyphilis the result of the Wassermann test is negative in both blood and cerebro-spinal fluid in 10%, and negative in the blood though positive in the cerebro-spinal fluid in 30%.

The author emphasizes the comparatively common early incidence of involvement of the nervous system, "early asymptomatic neurosyphilis", which usually responds satisfactorily to ordinary treatment. A residue to 26·4% of patients show some abnormality of the cerebro-spinal fluid after one or two energetic courses of treatment, and of these some remain resistant to further ordinary courses of treatment, the "late asymptomatic neurosyphilis". It is from this group that most of the parenchymatous forms will later arise, and the desirability of malarial treatment for this group of symptomatic cases is urged.

It is stated that it is doubtful whether any patient who has acquired syphilis can afford to neglect periodical neurological examination, including an investigation of the cerebro-spinal fluid, even after a series of Wassermann tests applied to the blood and cerebro-spinal fluid have produced negative results, and with this there will be general agreement amongst neurologists and psychiatrists.

AIR RAIDS AND CASUALTIES.

MANY articles have been written on the treatment of air-raid casualties in the past few years, but the literature on the administration of air-raid casualty services is very scanty. G. B. Shirlaw, assistant medical officer (A.R.P.) to the Metropolitan Borough of Battersea, has attempted to fill this deficiency in his book on casualty training, organization and administration.[2]

The volume is divided into three sections; the first deals with the general aspects of air-raid precautions; the second deals with the organization and administration of a civil defence casualty service, and includes a scheme for the evacuation of the wounded; the third deals with the administration of different sections of civil defence casualty organization.

As the book was published in June, 1940, before the heavy air raids in England, there is much in it that is obsolete and many conjectures now known to be untrue. The continuous night raids on London, lasting from dusk till dawn, are a new departure in aerial warfare, and hence many of the schemes for the collection and dispersal of casualties have had to be abandoned and new ones substituted.

[1] "Neurosyphilis (Syphilis of the Nervous System)", by C. Worster-Drought, M.A., M.D., F.R.C.P.; 1940. London: John Bale, Sons and Staples Limited. Demy 8vo, pp. 255, with illustrations. Price: 10s. 6d. net.

[2] "Casualty Training, Organisation and Administration of Civil Defence Casualty Services", by G. B. Shirlaw, L.R.C.P., L.R.C.S., L.R.F.P. and S., with a foreword by O. Simonds, M.P., and an introduction by C. Francis; 1940. London: Secker and Warburg; Australia: Angus and Robertson Limited. Demy 8vo, pp. 302, with 70 diagrams and illustrations. Price: 15s. net.

Dr. Shirlaw gives a very good account of air-raid precaution organization in England in all its aspects, and anyone having to do with air-raid precaution work in Australia should read this to gain a general idea of the magnitude and ramifications of this branch of civil defence.

In view of recent experiences in London, his ideal scheme for the evacuation of casualties from the scene of bombing must be modified. It has been found, for instance, that many hospitals originally classed as base hospitals were exposed to as much danger as those classed as casualty clearing stations, and that well thought out evacuation schemes had to be instantly abandoned.

As the book is written mostly from an administration point of view, much of the first sections could be eliminated, especially those chapters dealing with the treatment of bomb casualties, which are too sketchy to be of any value. Many diagrams, for instance those of obsolete tourniquets and the pneumatic sprayer for tannic acid spray treatment of burns, now superseded by the tannic acid-silver nitrate method, are valueless and serve only as padding. Taken on the whole, however, it is a most instructive book in a subject that is of interest to us all in these strenuous times.

PROTOZOOLOGY.

KUDO'S new text-book[1] (for it is in many ways essentially a new text-book, although it is the second edition of a book published in 1931) represents the most recent compendium of protozoology in the English language.

In view of the importance of protozoology in medicine and veterinary science, taken in conjunction with the vast field and the output of research, it is essential to have some modern summing up of this animal phylum at hand. The volume under review is therefore of the greatest value. It is an excellent piece of work and now well up to date.

The arrangement of the chapters is such that after a short history of protozoology sections are devoted to the ecology, the morphological structure (in detail), the physiology, the reproduction, and finally to the phenomena of variation and heredity observed in the group. This occupies six chapters and roughly a quarter of the volume. Following this, 37 chapters cover an excellent systematic study of the different subdivisions. Many of these are, of course, of no direct significance in medicine, but any book of reference which treated the subject in another way would be of greatly diminished value. The relationships between parasitic and free-living forms are often very close indeed, and comparison is essential. A list of literature follows each chapter.

We can recommend the volume as a useful adjunct to the laboratory, whether of pure zoology, pathology, public health or veterinary medicine.

THE TECHNIQUE OF PSYCHOANALYSIS.

THOSE who fear that the British Psycho-Analytical Society has signed on the dotted line should read "An Investigation of the Technique of Psycho-Analysis", written by Dr. Edward Glover, Director of Research of the Institute of Psycho-Analysis, with the assistance of Dr. Marjorie Brierley, Assistant Scientific Secretary, British Psycho-Analytical Society.[2] Indeed, if appendices constitute the meat of a book as postscripts are said to do of a letter, the reader might think that some members of the society were actually opposed to Freud, were it not for the fact that their attitude is a sign of the vitality of his principles rather than of opposition to them. Melanie Klein, and those who support her viewpoint, have not only confirmed Freud's discoveries, but have gone beyond them. As is usual in science, this advance followed a modification of technique necessitated by the study of new material. The method of free association introduced by Freud for the study of adults was modified by Melanie Klein so that it might be applied to young children; they were encouraged to play with toys and other objects as well as with words and ideas. As a result of the direct study of the very young, observations have been made which enhance the value of previous psychoanalytical discoveries by extending the knowledge of pregenital impulses. As with all advances, however, those mentioned have not been made without opposition; but this opposition is fulfilling the useful function of keeping a check on over-emphasis of the new at the expense of the old.

It will be realized from the foregoing that, though the book under review is limited to an inquiry concerning technique in adult analyses, it cannot escape the stimulating effect of the work among children. Also it will be obvious, considering the state of flux as to theory brought about by the discovery of new facts, that, though there is a consensus of opinion on most points of practice, room exists for considerable variation. The aim of the investigation has been to summarize the answers to a detailed *questionnaire* issued to the members of the society, giving majority and minority opinions on each question, together with comments by the "editors". The result has been a very valuable guide for the use of practising psychoanalysts.

A REFERENCE BOOK ON ACUTE INFECTIOUS DISEASES.

IN writing the third edition of "Acute Infectious Diseases", Dr. J. D. Rolleston has been joined by Dr. G. W. Ronaldson, the medical superintendent of the South Eastern Hospital, London.[1]

Ronaldson is responsible for the chapter on isolation methods, and his excellent compact survey of this field will be of interest to those in charge of all types of hospitals.

There is no need to stress the general soundness of the works of Rolleston. The present volume contains much interesting material in a very readable form. The history of the various diseases is rather more fully covered than is usual in small volumes, but the descriptions follow conventional lines.

The book is subtitled "A Handbook for Practitioners and Students", but we find it impossible to recommend the work to undergraduate students, and we think that few experienced graduates would be satisfied with it as their main guiding literature. For the undergraduate student the work contains too much that is unimportant; but the outstanding weakness is the lack of a deliberate and sustained attempt to correlate pathology with symptomatology and treatment. The result is the lack of that clear picture of each disease as a whole with which the young student should be presented. His vision will be clouded by unduly prominent considerations of variations and rarities.

An example of the inclusion of unimportant material is found on page 105, where a paragraph is devoted to the variation of the oculo-cardiac reflex in cerebro-spinal fever as a diagnostic point. Most clinicians have never heard of this. The description was given in 1915 for a series of twelve cases, and it has not been heard of since. The inclusion of such material, and there are several examples just as bad, in such a short work (475 pages) borders on pedantry.

In descriptions of technique of treatment much space is wasted. For example, on page 122 we are told how to go about cisternal puncture, but are left with the needle in the dura. The description of intravenous infusion is even more scrappy. We do not think that the student or the practitioner will refer to a book on infectious diseases for help in such technical procedures, so space is wasted with descriptions which in any case are so incomplete as to be useless.

The clinician will find in this book references to most if not all the recorded rarities, as well as many other points of interest; but he will prefer to consult larger works and original papers for most points. An extensive bibliography containing references of very widely varying value is included after each chapter. This bibliography, incidentally, takes up almost as much space as is devoted to pathology.

For the undergraduate student the sections on the various diseases in the standard medical text-books would serve better than this book, while for more detailed information there are more practical works available.

To sum up, the book is packed with interesting matter, but its evaluation is for the experienced. It is not a handbook, but a useful reference book which could have been much more useful had irrelevant matter been excluded.

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[1] "Protozoology", by R. R. Kudo, D.Sc.; enlarged and completely rewritten edition of "Handbook of Protozoology"; 1940. London: Baillière, Tindall and Cox. Medium 8vo, pp. 700, with 291 illustrations. Price: 36s. net.

[2] "An Investigation of the Technique of Psycho-Analysis", edited by E. Glover, M.D., assisted by M. Brierley, M.B., B.Sc.; 1940. London: Baillière, Tindall and Cox (for the Institute of Psycho-Analysis). Demy 8vo, pp. 198. Price: 10s. 6d. net.

[1] "Acute Infectious Diseases. A Handbook for Practitioners and Students", by J. D. Rolleston, M.A., M.D., F.R.C.P., F.S.A., and G. W. Ronaldson, M.D., D.P.H.; Third Edition; 1940. London: William Heinemann (Medical Books) Limited. Demy 8vo, pp. 487. Price: 17s. 6d. net.

The Medical Journal of Australia

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All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

THE AFTER-CARE OF THE SURGICAL PATIENT.

THE medical student during his clinical clerkship in surgical wards is apt to draw false conclusions and perhaps to take the first steps in the formation of bad habits from what he sees of the treatment of patients. A man or woman suffering from a complaint that is designated surgical and that calls maybe for an elaborate surgical procedure and the removal of much tissue, is admitted to one of the beds. A full history is recorded, certain laboratory investigations are possibly undertaken, perhaps a clinical lecture is given by the patient's bedside and the diagnosis is made obvious to all the clerks on the surgical side, the anæsthetist visits the patient to determine what form of anæsthesia is to be used, other preparations suitable to the occasion are made and the patient is at length ushered to the anæsthetic room next to the operating theatre. Up to this time the student is aware that the surgeon has regarded the patient's illness from many points of view. Has he not made the clinical clerk discuss the differential diagnosis? Has he not made him give detailed and sound reasons why the condition is "this" instead of "that" or "the other"? Has he not questioned the clerk on different types of operative procedure, eliciting reasons why this approach and an incision running this way are more satisfactory than another approach and an incision running the other way? The clerk in nine cases out of ten is worldly wise, knows something of his chief's predilections, surgical foibles and technical vanities, and chooses approach and incision that he knows will be adopted by the great man. But in spite of his concessions to the surgeon's idiosyncrasies, the clinical clerk argues to himself that surely a man so erudite and capable, so gifted with diagnostic acumen and schooled by so vast an experience, must know all that there is to know of the patient, of his illness and of the necessary surgical treatment. Let us presume that the surgeon is in fact erudite, capable, and so on; the operation is performed in the best surgical tradition and the patient, from whom disease has been cut, is returned to his bed. The clinical clerk sees later on that the surgeon pays one or two visits to the patient's bedside, and the patient is sent back to the outer world of hurry and trouble, of stress and worry. Only in rare instances or with rare teachers does the student see the patient again. In these circumstances it is not in the least surprising that students gain the impression that when the patient has been operated on and leaves hospital he stands in no further need of attention—in other words, the treatment for the ailment that brought him to hospital is complete.

It must be admitted that there are occasions on which the treatment of a patient can be regarded as complete when the operation has been performed and a week or two have been spent in convalescence. In these instances the surgical procedure has generally been looked on as a minor affair and the patient, prior to the adventure, has been in fairly good fettle. But not all simple procedures absolve the surgeon from the need for after-care and attention to detail. For example, the removal of tonsils and adenoids from a child is often looked on as merely an incident in the child's career, unfortunate perhaps, but necessary, and yet not to be taken too seriously. The practitioner who operates on such children fails in his duty if he does not follow his operation by continuous treatment until mouth breathing has been abolished. If we consider only major surgical incursions, such as those in which extensive resections or intestinal anastomoses are carried out, we can consider after-treatment to be necessary from several points of view. In the first place, therapeutic measures may be called for by reason of the operation itself—the cutting out or joining together of structures. Treatment of this kind is generally completed before the patient is discharged from hospital, and is seldom, if ever, lacking. It is the most obvious treatment and will be impressed on the mind of the student clinical clerk. The second kind of post-operative treatment, which, by the way, is not always obvious, is that concerned with the condition for which the patient was originally suffering. For example, a patient with an anæmia of a type that demands splenectomy will need special attention, and a patient who has been subjected to gastro-enterostomy for peptic ulcer will for many days to come require treatment for what may be called an ulcer diathesis. Most surgeons will probably aver that this treatment is always carried out; but if this is true, the treatment is too often looked on as something quite apart from the surgical therapy that has been so carefully planned, elaborately staged and meticulously performed. In these circumstances the student clinical clerk is apt to see the operation as the end of treatment and not as a means to an end. In hospital practice, after-treatment of this kind is nearly always delegated to the honorary physicians in the out-patient department, and the surgical staff, seeing the patient no more, may be unaware of the final outcome of the patient's illness. There is a third kind of treatment and this is psychological. It should be continuous with the general attitude adopted by the surgeon when he tells the patient

in the first instance that an operation is necessary. Admittedly surgeons are not like the dear old lady who said to her friend about to enter hospital for an operation: "Oh! Well, I hope you get along all right; people generally do, but you never know, do you?" Surgeons are so accustomed, however, to operations as part of every day's routine that they may possibly forget that the control exercised by one patient's nervous system may differ from another's as widely as the poles are apart. To many patients whose mentality would usually be regarded as normal, a surgical operation is a great ordeal that leaves its mark in various ways. The psychological treatment that is doled out to these persons is of the utmost importance. Many surgeons do not need to give special consideration to this aspect of treatment until they find a patient who stands in need of special attention—they inspire confidence, and are never guilty of any action or any remark that is psychologically *gauche*. When the special occasion arises, the surgeon must take special pains to correct errors and to turn the patient's footsteps in the right direction. Cases will no doubt occur in which special psychological treatment may best be undertaken by the family physician. The surgeon, brilliant operator, brilliant carpenter, though he may be, is not in virtue of his craftmanship always best suited to give special psychological treatment. The family physician will know more of a patient's general make-up and susceptibilities than a surgeon can be expected to know on a short acquaintance, and should be entrusted with after-treatment of this kind oftener than he is. The psychological aspect of after-treatment should be specially brought to the notice of students in the surgical wards, but this cannot be done effectively if the patient disappears as soon as he is discharged from the ward.

So far, this question has been discussed chiefly from the point of view of the student clinical clerk; the patient's point of view has also been mentioned, particularly in relation to his mental attitude. There remains the surgeon. In his recent president's address to the Victorian Branch of the British Medical Association, published in our issue of January 18, 1941, Dr. H. C. Colville made some trenchant remarks on the traditional division of honorary staffs of hospitals into those attending in-patients and those attending out-patients. In his advocacy of continuity of treatment, he said that the clinician's ability to learn by experience was tremendously reduced if his opportunities to observe the results of his treatment were confined to one phase of the patient's illness. He supported his observations by a quotation from an address by the late Hamilton Russell, and, predicting that a reorganization of the present hospital system was inevitable in the near future, urged that the continuity of treatment associated with the unit system should be introduced. It is noteworthy that at least in some large centres orthopædic surgeons on hospital staffs attend both in-patients and out-patients, and in these circumstances they can be under no misapprehension as to the final condition of their patients. The general conclusion can be stated that if surgical practice in hospitals can be so arranged that the surgeon does not relinquish the charge of his patient from the beginning to the end of his illness, the patient will reap an advantage, the surgeon will be richer in experience, and the student clinical clerk will in his early years form habits that will be most valuable to him in later life.

Current Comment.

LIGHT AND LITERATURE.

IN the posthumously published "Comments and Characters" by the late John Buchan (Lord Tweedsmuir) there is a pleasant essay on the modern vogue of the cheap reprint. "There has been a general reaction in favour of small books, which is the reprint size. Our grandfathers liked folios and rows of square octavos. Nowadays most people detest a big book to read or even to look at. We no longer worship heavy mahogany bookcases filled with large symmetrical complete editions—we have learned the charm of lightness and daintiness." It is rather surprising that this author whose detached and sane analysis combined with so much kindliness has aroused a deserved admiration should have missed the physiological aspect of the matter. Put briefly, modern readers have better vision and have the benefit of better artificial illumination. Assuredly one of the major triumphs of medical science has been the preservation in middle and even old age of the eye of youth, chiefly through corrected astigmatism. Scholars like Bentley, Johnson, Gibbon and Porson read folios and quartos for the excellent reason that the reading presented no difficulty especially in the morning with untired eyes; but the small octavo or duodecimo would have been irksome. Be it remembered that astigmatism due to corneal malcurvature was discovered by the astronomer Airy as late as the eighteen thirties and the correction by cylindrical lenses was not in fair working order until years later. Much of the irritability of Carlyle and the neurasthenia of Darwin has been ascribed to eye-strain, whilst absence of modern methods of diagnosis and of lens prescription lost us thirty years of Pepys's diary at a time when such a diary would have been exceptionally interesting. When we consider the physical handicaps we cannot fail to be astonished at the amount of reading which the old-time scholar, such as Gibbon, managed to get through, but Gibbon's modern editor, Bury, probably read twice as much and with less effort. Johnson's eyesight was indifferent and led to accidents when he tried simple chemical experiments; his attempt to distil "æther", for example, nearly set fire to the home of his hosts the Thrales. His reading, like that of his contemporary Gibbon, was mostly amongst folios, quartos and large octavos with ample page and print. Quite an interesting essay could be written on the visual disabilities of poets from Dante to Tennyson, of course without the omission of Milton, whose blindness has a book all to itself, and a disciple of Mark Twain might amuse us by a fantasy entitled an ophthalmologist at the court of Queen Anne.

The other physical factor is the poor illumination in the past in the long winter evenings of north-western Europe. In Johnson's "Vanity of Human Wishes" the unfortunate scholar is described as oppressed by "toil, envy, want, the patron and the jail", but there is no mention of the tallow candle in the feeble glow of which he wrote and read, for the good reason, we may surmise, that the man of means, though he could afford candles of beeswax and at a later date of spermaceti, was little better off when daylight faded. Then again until the invention of "pickling" the wick the unfortunate reader or writer had to be vigilant and keep the wick from growing to extravagant lengths with consequent one-sided wasting of the tallow or wax. The snuffers which one can pick up in antique shops were dainty devices for the softer sex; men used their fingers and often got burned. Our age has also produced the inestimable benefit of an illuminant which does not vitiate the air, and a generation has grown up which cannot realize how oppressive and unhealthy church, theatre and concert hall really were when lit by naked gas jets and indifferently ventilated. Poor Dickens would lecture night after night to crowded audiences in halls flaring with bat's-wing burners and go home with flushed cheeks and throbbing temples and a general discomfort too often relieved by brandy. We have today the

correction of visual defects brought to a refinement of success undreamed of at the beginning of the century and we have a beautiful illuminant which keeps the air sweet and untainted in the study and library. Alas that war conditions should curtail our supply of new books and, through a curious regulation restricting the export of money, practically stop the purchase abroad of second-hand volumes which are the very life-blood of scholarship. Still things might be worse and our thanks should be extended to the Commonwealth Government for its graceful capitulation over the proposed sales tax on literature.

REACTIONS TO THE FRIEDMAN TEST IN NON-PREGNANT STATES.

THE Friedman test is preferred by some to the Aschheim-Zondek test, chiefly on account of the rapidity with which a positive reaction can be obtained. It has never, however, been considered quite as sensitive and accurate as the original mouse test, and neither test is comparable with accurate chemical estimations of the active gonadotropic substances. E. Perry McCulloch and W. Kenneth Cuyler[1] point out that when inexpensive and accurate quantitative methods become more readily available, the scope and value of gonadotropic hormone investigation will be greatly increased. Their purpose in recording a number of positive reactions to the Friedman test obtained in non-pregnant states is not, however, to deprecate the value of this test in the diagnosis of pregnancy, but to show that its value may be extended to conditions other than pregnancy. In addition, positive reactions which may in the past have been misleading may be better anticipated and more accurately interpreted.

In performing the test, the authors use adult female rabbits which have been isolated for three weeks. Concentrated morning specimens of urine are used. Four cubic centimetres of urine are injected into the ear vein of the rabbit on each of three occasions daily for two successive days, and the abdomen is opened under ether anæsthesia on the morning of the third day. The following findings are considered to constitute a positive reaction: (*a*) freshly ruptured Graafian follicles, (*b*) hæmorrhagic follicles or (*c*) fresh *corpora lutea*. The degree of response is recorded as 1 to 4 plus on a basis of 4 in any one of the types of response mentioned. Of 2,134 cases, in which neither pregnancy nor evidence of chorionic tissue was present, positive results to Friedman tests were obtained in 241. In considering the large proportion of positive reactions in the series presented, the authors observe that it should be remembered that all tests were made on individuals suspected not of pregnancy but of some endocrine abnormality, and the frequency of positive results is thus not comparable with the so-called "false positives" found in cases in which the test was done only when pregnancy was suspected. In their series of 380 Friedman tests carried out as an aid in the diagnosis of pregnancy there were no false positive reactions. However, there were two "false negatives", giving the test a percentage error of 0·53.

The work here under review suggests that the Friedman test may be useful in determining whether or not there is an abnormally large excretion of gonadotropic hormone in non-pregnant states. Of the 241 positive results obtained from the urine of patients who were not pregnant, 117 were associated with puberty, the menopause, or ovarian deficiency. Twenty-three were associated with testicular deficiency or testicular tumour. A group of 64 patients were suffering from endocrine disorders occurring in either sex, such as pituitary tumours and organic lesions in the hypothalamus, dyspituitarism, or disorders of the adrenal cortex. Disorders of the nervous system accounted for 26 positive reactions, and miscellaneous conditions not clearly endocrine in nature for eleven. Three positive results were given by patients with *alopecia areata*. These various clinical states in which a positive Friedman reaction was obtained are described in detail and the descriptions are of great interest. False positive reactions have, of course, been recorded from time to time, but they are naturally enough rare in any series of patients examined for confirmation of a diagnosis of pregnancy. McCulloch and Cuyler have tackled the problem of "false positives" from a novel point of view and they have certainly shown that a variety of conditions other than pregnancy may be associated with an excretion of sufficient gonadotropic substance to produce a positive Friedman reaction.

[1] *American Journal of Clinical Pathology*, September, 1940.

THE NATURE OF HUMAN LEUCHÆMIA.

THERE are few diseases more baffling than those which we classify as leuchæmias. A child or a young adult has been tired or out of sorts for a few weeks; increasing pallor has been noticed, and perhaps a few trivial hæmorrhages from the gums or into the subcutaneous tissues. A blood count reveals the true state of affairs, and the medical attendant realizes with a feeling of utter helplessness that he is confronted with a rapidly fatal malady and that he can do nothing but give it a name. Leuchæmia has been compared to malignant disease, and there is certainly no reasonable doubt that certain leuchæmias of fowls and mice are forms of malignant neoplasm. But whether these conditions have any connexion with the human disease is still open to dispute. M. C. G. Israëls[1] believes that the two groups of diseases are not analogous. The theory that leuchæmia is a form of malignant neoplasm is based almost entirely on the studies of the transmissible leuchæmias of fowls and rodents. It has not been possible to transmit the disease in domestic mammals, or in man. Israëls points out that this is not surprising, because the successful transmission of spontaneous mouse leuchæmia depends on the use of highly inbred susceptible strains of genetically uniform animals which have previously received a large dose of X rays to disable their blood-forming tissues.

Following a modification of Osgood and Brownlee's technique, Israëls has cultivated cells from the bone-marrow of patients with various forms of leuchæmia. The histories of the four patients in the present series are given in detail; in each instance the patient died a few weeks after the diagnosis was made. In the fourth case, in which the diagnosis was obscure, attempts at culture gave results which were subsequently confirmed by the clinical course of the disease.

Under the experimental conditions the leuchæmic cells developed in a manner resembling normal. After about two weeks a majority of primitive (embryonic) cells were converted into a majority of more mature types. In the case of myeloid leuchæmia, myelocytes, metamyelocytes and young polymorphonuclear cells were predominant and mitosis was still occurring among the myelocytes. In the cases of monocytic leuchæmia the cultures, after two weeks, consisted almost entirely of mature phagocytic monocytes. Small numbers of undifferentiated and differentiated myelocytes present in the marrow of monocytic leuchæmia patients developed in the same way as those from myeloid leuchæmia patients.

Dible and Davie have pointed out that the crucial difference between normal and malignant cells is that if implanted into a fresh host, the former are most likely ultimately to be absorbed, while the latter maintain their property of unlimited growth. The evidence provided by the work of Israëls shows that *in vitro* the leucocytes in human leuchæmia have not assumed recognizable malignant characteristics, such as the rapid mitotic division and fixity of type which have been noted in the cell of the transmissible leuchæmias. Richter says of leuchæmic cells that the only consistent features are increased proliferation and failure to reach maturity; in some cases even the latter feature is missing. The experiments described here agree with this statement.

[1] *The Journal of Pathology and Bacteriology*, September, 1940.

Abstracts from Medical Literature.

RADIOLOGY.

Half-Axial Projection in Accentuated Lordosis for X-Ray Studies of the Lungs.

KNUT LINDBLOM (*Acta Radiologica*, April 30, 1940) describes a half-axial projection for visualization of the apices of the lungs, and suggests that it should be adopted as a part of routine examination. The patient stands or sits, leaning well backward, with the upper portion of the interscapular region towards the film. The head is bent forward and the abdomen and shoulders are thrust forward; the direction of radiation is horizontal. The exposure should be increased by about 10 kilovolts. In this view the upper lobes and principal fissures generally appear. The ribs run horizontally and the shadows of the clavicles lie above the apices of the lungs. The contrast between the pulmonary tissue and that of the surrounding area is greater than in the frontal view, owing to the greater depth of the respective layers. Apical cavities may not be clearly seen in the frontal view. In many of these cases the cavities are very well shown in the half-axial projection.

Intussusception: A Radiological Study.

E. ROHAN WILLIAMS (*The British Journal of Radiology*, February, 1940) states that it is only necessary to observe, under fluoroscopic control, a typical case of intussusception to realize that the signs are as striking and as pathognomonic as any observation in gastro-intestinal radiology. Appearances seen after an opaque enema has been given are: (i) The enema may be completely arrested; this gives no peculiar features, but a close examination of the site may reveal slight "ringing" due to the emulsion's becoming slightly insinuated around a central large defect. (ii) The head of the enema may be arrested for a short time, with a gradual movement proximally towards the caecum. (iii) The enema meets the apex of the intussusception centrally in the lumen, but peripherally the emulsion creeps around the defect to become arrested. This produces a "cupola" defect, which, when further deepened, may be termed a "pincer" defect. (iv) Considerable "ensheathment" by the emulsion may occur, leaving a large central filling defect in the long axis of the colon; the emulsion is "filmed-out" in a characteristic manner, a series of coarse, somewhat irregular bands being seen; these bands tend to be parallel to one another. This appearance is due to the emulsion's insinuating itself between the flattened and œdematous mucosal folds of the two layers of the gut, which are closely apposed. The central defect is due to the intussusceptum with the indrawn mesentery. (v) Rarely the emulsion may enter the central cylinder as a thin streak with fine longitudinal linear markings. The visible signs described coincide in most cases with the tangible sign of a mass. With the exception of the sign of total stenosis, all the signs described may be fixed at any one stage; but all may develop in the order described—that is to say, a "cupola" defect may become an extensive ensheathment. During the time that these appearances are noted the enema may be slowly reducing the intussusception. In the ileo-caecocolic type, once reduction has started, as the head of the enema reaches the ascending colon, there is often a sudden acceleration of the reduction and the caecum may belly out quite audibly.

Recognition of Synovioma by Means of Radiology.

RAYMOND W. LEWIS (*American Journal of Roentgenology*, August, 1940) states that in a small series of four cases an unusual and striking radiological appearance has been found in each instance to indicate a synovioma, or synovial sarcoma, either malignant or with potential malignancy. Near a joint and sometimes involving the joint is seen a rounded, sometimes rather lobulated, sharply defined soft tissue tumour mass. No differential diagnosis can be made of such a mass in itself; but when in the mass is found a scattered and irregular deposit of amorphous lime, a provisional diagnosis of synovioma is justified, and the probability of malignancy should be borne in mind. In two of the cases reported, clinical evidence of malignancy later developed. This distinctive radiological finding seems to occur in about 25% of synoviomata, and thus far no other pathological condition giving similar radiological findings has been encountered. The calcifications in angiomata are very orderly and in the characteristic form of phleboliths. Exostoses and osteochondromata are more extensively calcified and have the pattern of orderly bone throughout, except in their cartilaginous caps, where the lime deposit may be quite irregular.

Failure of Lung Expansion after Thoracotomy for Acute Post-Pneumonic Empyema.

L. A. HOCHBERG (*American Journal of Roentgenology*, August, 1940) concludes that failure of the lung to expand after surgical drainage of a post-pneumonic empyema may be due to bronchial obstruction caused by retained secretions. In any case of post-pneumonic empyema which assumes an atypical course and which is associated with incomplete expansion of the lung, the presumptive diagnosis should be bronchial obstruction until it is ruled out. In the light of bronchoscopic observations in such cases it appears that the persistent atelectasis after adequate drainage of the purulent collection can be attributed to retained secretions in the smaller radicles of the bronchial tree—in the bronchioles and alveoli. Röntgenographic studies are indispensable in the diagnosis. If the obstruction is not relieved it leads to chronicity; its early relief leads to rapid and complete expansion of the lung and cure of the empyema.

Basal Exudates of Subphrenic Origin.

L. R. SANTE (*American Journal of Roentgenology*, September, 1940) states that ordinary methods of radiological examination in a great many instances fail to disclose subphrenic lesions as a basis for conditions found in the thoracic cavity. Pleural exudates may occur as sympathetic effusions due to adjacent subphrenic abscess, or there may be actual communication through the diaphragm between a subphrenic abscess and an empyema cavity. Malignant infiltration and erosion through the intestinal wall may serve as the ætiological factor in subphrenic involvement. After all ordinary methods of examination have failed, artificial pneumoperitoneum may be resorted to as a diagnostic agent without fear of the breaking down of adhesions or the spread of infection. By this method air enters freely into the subphrenic region on the uninvolved side, but is prevented from entering on the involved side by adhesions resulting from the subphrenic abscess. By no other radiological means can this be conclusively demonstrated.

Lipoid Pneumonitis.

B. R. KIRKLIN (*Radiology*, September, 1940) writes that among fats and oils that have been shown either clinically or experimentally to be productive of lipoid pneumonitis are liquid petrolatum, "Vaseline", milk fat, lard oil, cod liver oil, egg yolk, chaulmoogra oil and olive oil. It seems reasonable to assume, therefore, that almost any lipoid, whether of mineral, animal or vegetable origin, when taken into the lungs in sufficient amount, may give rise to the disease. The pathological process begins in the alveoli. There the collections of lipoid material are invaded by a multitude of phagocytes, which individually envelop particles of the material and solidify the oily accumulations. Epithelial cells lining the alveoli become cuboidal. Lipoid-laden phagocytes penetrate the alveolar walls, infiltrate the interstitial tissue and enter the lymph channels. Masses of phagocytes break down and release their lipoid contents, which are again enveloped in other phagocytes and giant cells, forming tumefactions like paraffinomata. Lymph channels become obstructed, lymph nodes enlarge and new nodes form. Marked fibrosis ensues, bronchioles are constricted and many corresponding alveoli dilate or collapse. With further contraction of the fibrous tissue, lobules or entire lobes become shrunken and retracted in varying degrees. The rounded or ovoid tumour-like masses, which may attain considerable size, become firm and sharply defined. Small or moderate pleural effusions may occur. Finally, as a result of infection, acute, recurring or migrating bronchopneumonia, varying in extent, often is added to the morbid anatomic ensemble. The radiological manifestations necessarily vary according to the stage of disease and the presence or absence of complicating bronchopneumonia. In early, mild, uncomplicated cases, fleck-like shadows appear in the basal and central portions of both lower lobes, often predominating on the right and sometimes involving the right middle lobe. With further advancement of the disease the bronchovascular-lymphatic markings become more accentuated and nodulated, and, in severe cases, gross, irregularly shaped, rather dense, discrete and confluent shadows of consolidations are interspersed through the region. Eventually, in chronic and severe cases, there is striking evidence of fibrosis, with strand-like shadows along the bronchovascular trunks, together with dense, sharply defined, irregular or rounded shadows, varying in size, number and distribution, but often largest or most numerous in the hilar regions. To the picture may be added the signs of local atelectasis,

compensatory emphysema or effusion. As a result of fibrous contraction an entire lobe may be represented by the dense rounded shadow of a tumour-like mass. When bronchopneumonia from infection supervenes, as it may at any stage of the lipoid disease, the radiological signs become more extensive and complex in ratio to the amount, intensity and site of bronchopneumonic involvement. The miliary mottling produced by early uncomplicated lipoid pneumonitis might perhaps be attributed to miliary tuberculosis, miliary metastases or *bronchiolitis obliterans*; but the situation of the lesion is not characteristic of any of these diseases. Advanced lipoid disease with gross consolidated patches has been mistaken for tuberculosis and bronchiectasis. At this stage also dense masses around the hilus may be suggestive of primary carcinoma of the lung, or rounded masses elsewhere may simulate those of malignant metastasis.

PHYSICAL THERAPY.

Nuclear Physics and Therapy.

J. H. LAWRENCE (*Radiology*, July, 1940) discusses the possible uses of the artificially radioactive isotopes in medical investigation and therapy. Because of the developments in the field of nuclear physics during the past few years, artificial radioactivity is available in nearly all the chemical elements. Radio-sodium, radio-phosphorus, radio-iron *et cetera* have the same appearances and chemical reactions as the inactive relatives of these isotopes; and therefore when injected into the animal body they are handled like ordinary sodium, phosphorus or iron. The "half lives" of these radioactive substances are very short compared with that of radium. The half life of radio-sodium is 14·8 hours, of radio-phosphorus 14·3 days. There seems to be no reason to use artificially radioactive substances as a substitute for radium unless radium or radon is not available. Since leuchæmic tissue, bone and bone marrow take up a relatively high concentration of phosphorus, it was suggested that radio-phosphorus might prove of value in the treatment of leuchæmia. Details are given of five patients suffering from chronic myelogenous or chronic lymphatic leuchæmia treated by the oral administration of radio-phosphorus in the form of sodium phosphate. The responses noted are similar to those that usually follow X-ray or radium therapy. The dosage of radio-phosphorus has been determined by clinical trial and animal experimentation and is probably much too small. In no case has the patient received more than an equivelent of three *r* daily, whole-body irradiation. The advantages are that this method is a means of giving whole-body irradiation continuously over a period of two or more weeks in a single oral dose of sodium phosphate, and there are no irradiation reactions. The effects of radio-phosphorus on two patients suffering from *polycythæmia vera* have also been studied.

The Use of Fast Neutrons in the Treatment of Malignant Disease.

R. S. STONE, J. H. LAWRENCE AND P. C. AEBERSOLD (*Radiology*, September, 1940) give a preliminary report on a new method of treatment of cancer, namely, the use of a beam of fast neutrons. Neutrons are electrically neutral particles of matter each having approximately the same weight as a proton, and are produced by means of the apparatus called the cyclotron, by bombarding a target of beryllium with nuclei of heavy hydrogen. The neutrons set free have energies up to 12 million volts, and spread out from the target in the same way as X rays do from an X-ray tube. These neutrons are then delimited into a beam. Gamma rays, which are also produced in the apparatus, are cut out by a lead filter three centimetres thick. The problem of measuring the intensity of a neutron beam in units comparable with the Röntgen has not been finally solved. For practical purposes a convenient arbitrary unit is that quantity of neutrons which discharges the Victoreen condenser type *r* meter to the same extent as would one *r* of X rays. This unit has been called the neutron unit, and abbreviated as "n". After consideration of the comparative effects of X rays and neutrons on different biological indicators, it was decided that the number of neutron units which could be tried with safety on a patient would be about one-quarter the number of Röntgens to produce an erythema with 200-kilovolt X rays. From September, 1938, to June, 1939, twenty-four patients were treated. They were all suffering from disease so far advanced that there was no chance of cure by X rays, radium or surgery. These patients were given single erythema doses only. Lesions in various locations were treated, but chiefly about the mouth and throat. The skin and mucosal reactions were similar to those produced by X rays. In every case there was some decrease in the size of the primary lesions and the metastases, and especially of cervical metastases. Since the latter half of 1939 fractionated treatments have been used, and the immediate responses of the lesions have been greater than before and the general reactions of the patients less pronounced. The results have been considered promising enough to warrant an extensive and thorough trial of the method.

The Double Radium Mould Treatment of Carcinoma of the Floor of the Mouth and Lower Alveolus.

A. G. MELVILLE (*British Journal of Radiology*, October, 1940) points out that during recent years the treatment of carcinoma of the floor of the mouth and adjacent alveolus has been revolutionized. Ten years ago surgical operations for the extirpation of such lesions were not uncommon, usually involving gross mutilation and considerable operative mortality. These tumours are now rightly considered by all to be better treated by radiotherapy as far as the primary lesion is concerned. Surgery alone or in combination with radiation is still the method of choice for metastases in the cervical glands. At the Holt Radium Institute, Manchester, where the author has worked, it is believed that the so-called "double radium mould" method is the ideal one for lesions in this situation. The method essentially consists in sandwiching the tumour between a layer of radium in the mouth and a second layer under the chin. The intraoral mould is made on a plaster cast of the patient's mouth and is therefore an exact fit. The outer mould is moulded on the patient's neck and lower jaw. Both moulds are usually applied for about ten hours a day for ten days. The dosage considered optimum is 9,000 *r* at the mucous membrane and 6,000 *r* on the skin, with a minimum dose of about 5,000 *r*. The technical factors necessary for accuracy of dosage are emphasized. From 1933 to 1938 inclusive 96 patients have been treated by this method. Of those patients who have been under observation five years or more 32% are alive; and of those observed for three years 47% are alive. Obviously if glandular metastases had not occurred these results would have been higher.

Late Results in Supervoltage Röntgen Therapy.

T. LEUCUTIA (*American Journal of Roentgenology*, October, 1940) attempts to furnish statistical proof as to the superiority of supervoltage X-ray therapy with 500 to 600 kilovolt equivalent (seven millimetres of copper) over that of deep X-ray therapy with 200 kilovolt equivalent (one millimetre of copper). An analysis of all patients treated in 1933-1934 indicates a three-year survival of 34% and a five-year survival of nearly 30%. In 93 cases in which previous deep X-ray therapy had failed and in which patients were treated secondarily with supervoltage X-ray therapy, only 8% survived the three-year and 4·5% the five-year period. It is evident that very little can be expected from supervoltage therapy when previous therapy at 200 kilovolts has failed. Ten groups of cancer were chosen, namely, carcinoma of the lower lip, of the tongue, the larynx, thyreoid, *cervix uteri*, *fundus uteri*, ovary, bladder, rectum and prostate. A total of 231 patients in these groups treated with supervoltage X-ray therapy between 1933 and 1935 is compared with 1,354 patients irradiated with deep X rays between 1922 and 1935. In the group of carcinoma of the tongue, 88% of the patients already had extensive metastases to the cervical lymph glands. Supervoltage therapy has decidedly improved the results in these cases, the three-year survival rising to more than 40%. In carcinoma of the larynx there has been some improvement. In carcinoma of the thyreoid the good results obtained by deep X-ray therapy continued to remain about the same with supervoltage therapy. In carcinoma of the *cervix uteri* the results have increased from 19% for the five-year survival to as high as 50% in some years. There has been very definite improvement in the results in carcinoma of the *fundus uteri* and rectum and some improvement in bladder and prostate carcinomata. In this analysis no particular attention is paid to the accessory methods of treatment, and no cases have been eliminated under any pretext.

A Method for the Preparation of Radon Ointment.

L. J. PERLMAN (*American Journal of Roentgenology*, May, 1940) describes the technique of preparation of radon ointment, which is a physical mixture or solution of a minute quantity of gaseous radon in "Vaseline". The method has been found to give results over a wide range of radon concentrations. It has also been applied to the preparation of beeswax β-ray plaques of low intensity. The particular use of this ointment is in the treatment of severe injuries of the skin following the application of X or γ rays. It also has been used in other skin conditions.

Special Articles on Psychiatry in General Practice.

(Contributed by request.)

XXXIII.

MENTAL HYGIENE: THE ROLE OF THE MEDICAL PRACTITIONER.

THE foundation of knowledge and practice in mental health rests on a proper understanding of basic principles. What are we studying and with what are we working? What do we hope to achieve? The ancient tag *"mens sana in corpore sano"* has been trotted forth so often that for many it has become both an explanation and a goal. Let the mind be sanely moulded, it advises, and the body properly nurtured, and the coach of life will be drawn smoothly along by these potent twins running in double harness. To this end the mind will be sent to a good school and the body encouraged to take part in manly games; and all will be well. Actually these two words are only abstractions convenient for purposes of description. There is in reality, in life no such thing as "body" as such, or "mind" a separate entity. In each individual there is only the "mind-body"—marvellously complex, imperfectly understood, but none the less a functional unity.

The modern conception of mental hygiene is based on this fundamental truth. Its significance lies in the implied idea that to understand human function and behaviour, both the so-called mental and the so-called physical must be considered. This does not mean that the terms body and mind should not be used. In discussion it will be necessary to stress at one time the one aspect and at another time the other. On occasion it will be obvious that a particular activity is predominantly mental or physical, as the case may be; but never is it exclusively either. The purpose of mental hygiene is to gain insight into the normal development and action of this body-mind and to apply that knowledge in the community. Although research must precede practice, both may advance together. Over the past forty years, and particularly in the last two decades, progress in both these directions has been remarkable. In a general outline of this kind perhaps the best way to cover so vast a field will be to indicate some of the outstanding ideas that have been evolved, to discuss their application in the growth and development of the individual, and finally to point out their significance to the practitioner of medicine.

The turning point in psychological progress, whereby the arid study of "mind" by intellectual and metaphysical means was discarded for something more dynamic and real, is mainly due to the work of Freud and his followers. To them we owe the conception of mental function influenced and often dominated by emotional forces acting outside the intellectual sphere, and not infrequently below the level of consciousness. These emotions have been evolved biologically and are a vital function of nervous, glandular and other body tissues. Their exact nature is but vaguely realized, and they can be studied only by their effects—often indirect—on human behaviour. As a process they represent a combination of inherited tendencies, interacting with the modifying influences of environment. Following the conception of emotion acting in a partly or wholly unconscious manner, Freud elaborated the analytic technique, a method at once diagnostic and therapeutic. This has placed into the hands of psychiatrists a means whereby the effects of emotions on personality may be traced to their origins, and in many instances harmful reactions to repression or abnormality removed. This is not the place for a critical evaluation of the amplifications and deductions that the various analytic schools have added to these fundamental observations. It is probable that some have overstressed the significance—great though it be—of the sex instinct, even if the word sex be stretched to include shades of meaning which may appear far-fetched. With improved sex education and more natural sex experience throughout childhood and adult life, it is likely that abnormalities based on this instinct will diminish. It is also clear that the other basic drives must have adequate scope if the integration of personality is to be reasonably satisfactory. The varying emphasis at present laid by different exponents on one or other emotion should soon be synthesized to a more comprehensive and workable whole. A further question may be raised. In both educational methods and therapeutic procedure—and particularly in the former—great changes have rightly followed the impact of the new psychology on the stereotyped thought of the past. The best of these are to be seen in the modern child development centres and kindergartens, where almost perfect provision is made for the progressive emergence and growth of the child's emotional life. The query in my mind is a partly philosophical one. It is this: emotional adjustment, though desirable, is in somewhat the same category as healthy physique—a necessary foundation, but not the goal of human achievement. On this foundation it still remains to build the ethical, æsthetic and spiritual characteristics that represent the summit of man's capacity. It is not always apparent that these aims are fully appreciated and deliberately sought.

Arising out of the changed orientation of psychology and its most important practical outcome to date is the rediscovery and ever-widening realization of the importance of healthy and happy childhood as determining mental health in later life. A great deal of accurate information is now available dealing with the normal mental growth of the child at every stage of development. This knowledge is valuable in many ways. Educational programmes can be intelligently planned. Comparisons can be made between the behaviour of any one individual and the normal with regard to many aspects of emotional or intellectual activity. In so doing it must be realized that there is a wide range of variation within the limits of normality. Any attempt to fit each child into too rigid a mould is to be strongly deprecated. Here knowledge must be tempered by experience and common sense. The significance of heredity, moreover, as a determining factor in behaviour is much less well understood than that of environment. The tendency of some writers almost to ignore the former is surely unscientific. Regarding the dissemination of information in the community further difficulties arise that have exercised the minds of mental hygiene committees all over the world. At one end of the scale we have the experience of the past thirty years in the United States of America, where the best and most extensive work has been done. There, although fine results have been achieved, signs are apparent that the lack of a sufficiently critical approach has sometimes led to the movement being "over-sold". The unwary have thereby come to believe that the promised land lies just round the next psychological corner. In this country, on the other hand, owing to the wide prevalence of parsimony and ignorance, we find little concerted effort to enlighten the public at all. Probably the wisest method would be an educational programme commencing in the later school years and continuing through early adult life. In this way the subject of mental hygiene would fall naturally into its position of fundamental biological and sociological value, and would be studied by all at their most receptive age. At present, parent and adult education has many drawbacks. A little ill-digested learning often produces anxiety and strain rather than mental poise. It may also lead to the misconception that "complete freedom" is the sole prerequisite for proper character formation—an unfortunate distortion of the real position, namely, that all children should be provided with freedom and means to develop along healthy natural lines. To do so they will, however, need both wise supervision and some degree of outside assistance and control. Greater discrimination would also diminish the proportion of faddists and mountebanks who still wield an influence and gain rewards out of proportion to their merits.

Part of the blame for this last-mentioned state of affairs lies at the door of the medical profession. Their attitude, on the whole, has been too conservative and unimaginative towards the potentialities opened up by research in mental hygiene, with a result that much of the practical work being attempted is already in non-professional hands. It should be apparent to all who consider this problem that the maintenance and restoration of health of the "body-mind" can, apart from its purely educational aspects, best be accomplished by those who have the widest knowledge and experience in matters of health, namely, medical practitioners. This could be accomplished in the fields of both private practice and public medicine if—and this brings us to the crux of the matter—medical education in this country was widened to include the teaching of mental health to all medical students. There might be some difference of opinion as to the best method to be employed. My own belief is that this subject should be introduced throughout the course, commencing as part of biology, when animal behaviour would be dealt with, perhaps to the exclusion of some anatomical and physiological details now included. Similarly, physiology would be broadened to take in normal human psychology. In the clinical years—in addition to lectures on psychopathology and psychiatry, which need deal only with fundamentals, the mastery of these arts being left to post-graduate study—the psychological aspects of health and disease would be brought in, both in lecture and in clinic, in conjunction with other medical instruction.

For example, in dealing with diet and disorders of the digestive system, the "mental" as well as the "physical" aspect would be dealt with at the same time. As nearly half the ailments referred to this system are psychogenic, such an approach should have much to commend it, and is more logical than that at present in vogue.

In conclusion, fault should not be found with medical practitioners for their present limited knowledge of mental hygiene. They cannot know unless they are taught. When this is done, as it assuredly will be, doctor and patient will greatly benefit.

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Special Abstract.

AN INVESTIGATION OF THE HOSPITAL PROBLEM IN AND AROUND SYDNEY.

DR. H. H. SCHLINK, Chairman of the Board of Directors of the Royal Prince Alfred Hospital, has recently published in the form of a brochure the results of a survey of the hospital problem of Sydney.[1] Dr. Schlink believed that if he made a survey of the hospital beds available in the metropolitan and suburban area of Sydney, which had not previously been done, the statistics he collected might stimulate the authorities to undertake an official survey on the lines of that carried out in New York.

Dr. Schlink first deals with the types of hospitals found in the area. These are: (i) general hospitals with medical schools (the Royal Prince Alfred Hospital, Sydney Hospital and Saint Vincent's Hospital); (ii) special hospitals which cooperate with the university in teaching medical undergraduates or graduates; (iii) metropolitan hospitals, including base hospitals in the country; (iv) suburban and small-town hospitals; (v) communicable diseases hospitals (one at the Prince Henry Hospital, and several collecting depots attached to the general hospitals); (vi) subacute diseases hospitals ("Yaralla", the recently opened Dame Eadith Walker Convalescent Hospital, has provided 50 beds for non-ambulatory patients with subacute diseases; the average limit of stay is three months); (vii) convalescent homes for ambulatory patients (there are four such homes, as well as the Collaroy home belonging to the Royal Alexandra Hospital for Children, which is now becoming more a subacute diseases hospital); (viii) hospitals and homes for patients with chronic diseases, the aged, the infirm, incurables or the dying; (ix) hospitals and sanatoria for tuberculosis patients (there are several sanatoria, but only two indoor collecting depots for patients with acute lesions, one at the Royal Prince Alfred Hospital and the other at Randwick; recently several other metropolitan hospitals have established small units); (x) hospitals and asylums for the insane.

The next subject discussed is the ratio of beds to population. World standard figures, calculated from various sources, appear to be as follows. In acute diseases hospitals the distribution of beds per 1,000 of population is 5·00 beds in general hospitals, 0·45 bed in maternity hospitals, 0·50 bed in children's hospitals, and 0·5 bed in contagious diseases hospitals. Most authorities consider the beds in maternity, children's and contagious diseases hospitals to be in addition to the 5·00 beds per 1,000 of population in the general hospitals; this leaves a 25% surplus for ordinary fluctuations and emergencies. As a general rule, one-third less of these estimates can be allowed for rural districts. With regard to chronic diseases hospitals, in the calculation of world standard figures the hospitals for subacute diseases, convalescent hospitals, chronic diseases hospitals and homes for the aged, infirm, incurable and the dying are usually classed together as requiring 2·00 beds per 1,000 of the population, divided as follows: subacute diseases hospitals 0·5 bed, convalescent hospitals 0·5 bed, and hospitals and homes for patients with chronic diseases, the aged, infirm, incurables and the dying, 1·0 bed. Tuberculosis hospitals and sanatoria, according to the National Tuberculosis Association, require one to two beds for each annual death from the disease in the State, district or city concerned (the average death rate for five years is usually taken). Great variations exist in the needs of mental hospitals (from two to seven beds per 1,000 of population). The reason is that mental hospitals have permanent patients, and the suitability of the district rather than the population basis determines their location.

According to world standards, New South Wales requires 8·45 beds per 1,000 of population. According to the population at June 30, 1938, the number of beds required is 22,975; to this figure must be added the maximum number of tuberculosis beds required by the best world standard. For New South Wales the number would be 2,000. Therefore, for all hospital beds (mental hospitals excluded) the world standard is 24,975 beds. At the time of compilation of the report the number of beds available in the State was as follows. In the city: public hospitals 9,795, private hospitals 2,667 (total 12,462); in the country: public hospitals 7,932, private hospitals 2,305 (total 10,247). Thus the total number of beds (in both public and private hospitals) available is 22,709; this leaves a shortage of 2,266 according to the world standard figure. The shortage is mainly in tuberculosis beds (1,000), subacute diseases beds (590), contagious diseases beds (240) and chronic diseases beds (436). (Throughout this report the population figures are as at June 30, 1938; the figures for beds, in the absence of a statement by Dr. Schlink, are presumed to refer to the year 1940.) An interesting comparison is made between available and occupied beds under the control of the Hospitals Commission in city and country. The figures are as follows: in the city the available beds numbered 6,314 and the occupied beds 5,647; in the country the available beds numbered 7,932 and the occupied beds 5,218; the number of empty beds, on an average, was 667 in the city and 2,714 in the country. The number of in-patients and out-patients treated (presumably during one year) was 469,401 in the city and 136,299 in the country.

Proceeding to discuss these figures, Dr. Schlink points out that as the major portion of the problem concerns Sydney, he has confined his observations to the metropolitan and suburban area. Owing to the paucity and incompleteness of available local statistics, and the fact that no proper hospital survey has ever been taken in New South Wales, his remarks are often based upon his own knowledge of the subject. A comparison of the world standard bed to population ratio with the ratio existing in Sydney at the time of publication of the report gives interesting figures. At June 30, 1938, the population of the metropolitan and suburban area was 1,279,030; the beds available in public and proprietary or private hospitals serving the area numbered 12,462; the beds required for such a population, according to world standard figures, would be 11,809. This gives the impression that the beds available in the metropolitan and suburban area are in excess of world standards by 653. Actually, however, while the total number of beds is in excess, the distribution in the various classes of hospitals is anything but world standard. A dissection of the figures leads to a proper appreciation of the hospital problems. By this means the following facts are elicited: beds for general diseases are deficient by 442; there is an excess of 795 in maternity beds; beds for children are in excess by 553; for patients with contagious diseases and for those with subacute diseases there are deficiencies of 240 and 590 beds respectively; there is a shortage of 33 beds for convalescent patients; for patients with chronic diseases *et cetera* there is an excess of 652 beds; for tuberculosis patients there is a deficiency of 42 beds. With regard to the tuberculosis beds, Dr. Schlink points out that the world standard estimate of 1,000 for a State the size of New South Wales is a minimum; in most countries the standard would be half as high again and the maximum double the number.

Considering the figures *seriatim*, Dr. Schlink deals first of all with general diseases beds, in which there is a deficiency of 442. He states that there is an undoubted shortage of beds for acute medical and surgical conditions; but it is more apparent than real, because in the proprietary or private hospitals the excess of maternity or lying-in beds is available for use for medical and surgical purposes. Moreover, the construction work in public hospitals which was taking place at the time of compilation of the report, or planned for the future, will quickly abolish any deficiency. The world standard of maternity beds would be 575, and there are 1,370 in the area under review. The excess over world standard in this class of bed, Dr. Schlink considers, is due to the large number of proprietary or privately owned lying-in hospitals, usually converted dwelling houses, quite unsuitable in his opinion for their purpose. This state of affairs is in process of being remedied by the Government's projected programme of providing 506 maternity beds in the various public hospitals in the area. Dr. Schlink considers that, though this is an advance, it must be accomplished gradually, since it

[1] H. H. Schlink: "The Hospital Problem of the Metropolitan and Suburban Area of Sydney", 1940.

means the elimination of a similar number of beds in private or proprietary hospitals. Care is necessary in the geographical distribution of these beds; they must be placed in the districts where there is the greatest density of population. It is hard to explain why Sydney should require more than twice the number of obstetric beds calculated on the world standard. Dr. Schlink considers that either women appreciate the greater facilities and safety provided by hospitals, or the modern habit of living in flats, which are unsuitable for child bearing, has forced them to adopt what he described as their "hospital attitude". There is an excess of 553 children's beds over world standard. Dr. Schlink believes that the excess is even greater than the figures indicate, as only one-eighth of the beds for medical and surgical conditions in proprietary or private hospitals have been regarded as occupied by children, whereas at times the fraction might be as high as one-quarter of the 2,288 beds in these hospitals. Of a total of 1,193 children's beds available in Sydney, 908 were at the time of compilation of the report housed in public hospitals constructed for the purpose. Beds for contagious diseases are deficient by 240; but the fluctuation in communicable diseases is great, and emergency beds are always added during epidemics. The position with regard to beds for subacute diseases is clear; the world standard figure is 640 beds, and at the time the report was published there were only 50 beds available. Dr. Schlink makes the following comment:

> It is my belief that the present demand for beds, and the numerous outbursts appearing in the Press about dying patients being unable to gain admission to public hospitals, would be largely obviated by making up this deficiency in our hospital system. As an example, it has been found by a close scrutiny at the Royal Prince Alfred Hospital, which contains in the public section 625 beds, that 101 patients could be shifted to a sub-acute diseases hospital. If a similar review were made of the cases occupying the 4,378 general acute diseases beds in all our public hospitals, it would be found, based on our survey at Prince Alfred, that 700 of them could be evacuated from the acute general hospitals if there were a large enough sub-acute hospital to which they could be transferred. These cases are too ill to be sent home for nursing. If the sub-acute accommodation were available, 700 beds in the acute diseases public hospitals would be released for those emergency and very sick cases, about which a public outcry is now being made, and there would be no need to construct any new, or enlarge any existing acute hospitals—always an expensive matter . . . The cost of construction and equipment of sub-acute diseases hospitals is only half that of acute diseases hospitals, and the maintenance of the patient is also halved.

There is a shortage of 33 beds for convalescent patients; Dr. Schlink believes that this could be met by a small increase in the number of beds available at the three chief hospitals for convalescents. Any increase in beds for convalescents will tend to relieve the strain on the acute diseases beds in public hospitals. However, Dr. Schlink points out that he has found patients more anxious to go home than to go to a convalescent hospital as soon as they are able to walk.

With regard to hospitals and homes for patients with chronic diseases, the aged and infirm, incurables or the dying, the world standard is 1,279 beds, and 1,931 beds are available in the area under discussion. This excess of 652 over the world standard is accounted for by two facts: patients often remain for years in these hospitals, and the lack of any large hospital for subacute diseases makes it necessary for these hospitals and homes to admit as many patients with subacute diseases as they can. In the light of these facts the excess of beds for chronic diseases *et cetera* is reduced to 12. Dr. Schlink believes that it is essential to separate patients with subacute diseases from those with chronic diseases, since the equipment needed for the two types and the nursing of them are quite different. The limit of stay in a hospital for subacute diseases should average three months; there is no limit of stay in chronic diseases hospitals.

Beds for tuberculosis patients are only 42 in number below the minimum world standard; but in most countries 0·5 to 0·75 bed more for each annual tuberculosis death is allowed. Dr. Schlink believes that, as the hospitals for acute tuberculosis and the sanatoria have to cope with the tuberculosis problem of the whole State, they will need to be enlarged.

With regard to mental hospitals, Dr. Schlink states that the world standard varies in different countries from two to seven beds per 1,000 of the population. In the area under review there are 3·5 beds per 1,000. There is an undoubted necessity for an increase in the number of beds; patients, at the time when the report was prepared, were in some instances accommodated on couches and on the floors of the existing institutions.

Dr. Schlink next discusses the problem of finance. He states that there appear to be only four sources of financial support for hospitals, namely: (i) taxation and public funds, (ii) payments by patients, (iii) insurance and contributory schemes, (iv) endowments, donations and subscriptions. In the early days of the State most patients were treated in their homes, and few, except the desperately ill and poor, sought admission to hospitals. In such circumstances it was not difficult for the government of the day to meet its commitments from consolidated revenue, especially as the wealthy citizens gave freely to hospitals. With the development of surgery, however, and the introduction of numerous methods of investigation, diagnosis and treatment, the scene entirely changed; the medical profession and the public both demanded more and more from the hospitals for the elucidation and cure of disease. The expansion of industry and the increase in road traffic greatly augmented the number of accidents, and as a result there was a demand for more "emergency" beds; moreover, the increase in the population is an important factor in the demand for hospital accommodation. From the financial aspect it must be noted that as the number of patients increases so does the number of taxpayers, and in turn, consolidated revenue. Dr. Schlink remarks that this increase in the State's income has never been reflected in the grants to hospitals from consolidated revenue. The demands on consolidated revenue must have become so heavy that certain measures of indirect and involuntary taxation were introduced—first the totalisator, then the amusement tax, and lastly the lottery. Unfortunately, the successive governments did not add the results of these activities to the old hospital grants from consolidated revenue. While these changes were taking place, the efforts made by the public were being modified. Donations and subscriptions were halved, patients' fees were doubled, systematic contribution schemes came into being, more than replacing the amount lost from the reduction in donations; but social efforts for charity fell by two-thirds. A study of all the figures for the past ten years reveals that government aid and public effort share about equally the burden of hospital finance in New South Wales. In point of fact, the public has provided the greater part in almost every recorded year. Actually, the situation is that the government and public efforts combined are insufficient to meet the needs of a growing population, more and more members of which are using the hospitals' services.

Dr. Schlink considers that the first essential in efficient financing of hospitals is the establishment of two separate government funds, the first for capital expenditure on the construction, enlargement or improvement of hospital buildings, and the second to help maintain the patient—indigent patients entirely, the near-poor partly, the rich not at all. The responsibility of the government for these two forms of aid is quite different and distinct. Capital expenditure for construction, Dr. Schlink points out, benefits many generations of citizens and should fall upon the government as representing those generations. He believes that this money should always be raised by loans, and that the citizens of the day should be called upon to pay their share of the interest and sinking funds of such loans. Maintenance expenditure, on the other hand, Dr. Schlink believes to be an immediate responsibility of the citizen, except when he is indigent or cannot pay the full cost of his maintenance. It is the government's responsibility to help make up the maintenance commitments of the poor and near-poor; Dr. Schlink considers that this responsibility should come before the provision of aid for healthy unemployed or the education of the community. The first step, in his opinion, is to remedy the mistakes of the past. He advocates the striking of an average of the old hospital grants from consolidated revenue, which should be augmented to meet the increase in the population and then allotted to the government's hospital maintenance fund. He also urges that the whole of the proceeds from the State lottery, together with the amounts collected from the totalisator and amusement taxes, should be "earmarked" for the hospitals. Dr. Schlink points out that the public was told, when these sources of revenue were introduced, that they were for the hospitals.

New sources of revenue are then suggested. Dr. Schlink begins by stating that it has been his experience in other parts of the world that, as soon as a governmental or municipal hospital tax is introduced, the citizen sheds his responsibility and loses his interest in the hospitals; he considers it advisable that any additional taxation should be either covered up or indirect. It seems to him that taxation on alcohol and the motor car, both of which send

many victims to the hospitals, should provide some of the necessary revenue. He also considers that some of the proceeds of the unemployed relief tax should also be diverted to hospitals, "for who is more truly unemployed than the sick man on the dole?" The next statement is rather surprising: "Italy gets enough to pay for the upkeep of her army and navy by a stamp tax placed on every box of matches and every packet of tobacco sold."

Dr. Schlink considers, although he admits that he does not know the political implications, that the present tax for the unemployed should be an unemployment relief and hospital tax, as all patients admitted to hospitals are unemployed, "and unemployed in the most unfortunate sense of the term". He suggests that a small way of relieving hospital finance would be to grant hospitals complete exemption from water rates; this is done in Victoria. He points out that the increased cost to the community would be exceedingly slight—in fact hardly noticed. The same, he considers, is true of telephone and electricity costs. Road transport, in his opinion, which has placed such an increased burden on the hospital casualty departments, should be made to contribute to their upkeep. Finally, with regard to the State lottery, Dr. Schlink believes that a big lottery of £250,000 at Christmas or Easter would not be resented by the churches, and would in normal times attract money from every country in the world. He urges the imposition of some small indirect tax, but states that, failing that, a direct tax is essential.

Turning next to sources of revenue from public efforts, Dr. Schlink states that every patient should pay what he can afford towards his maintenance in hospital. Indigent patients amount to about 40% to 50% of the hospital population; Dr. Schlink believes that the remainder pay as much as they can afford. He holds that those who can afford to pay full fees should go into private hospitals or the intermediate and private wards of public hospitals, and therefore pavilions of suitable size should be available to such patients at every public hospital in the community. The best voluntary contribution scheme he considers to be that conducted by the hospitals themselves, the Metropolitan Hospitals Contribution Scheme, for the reason that the money is not paid to the patient, but directly to the hospital. He points out that most friendly and other similar societies, and insurance companies which underwrite hospital and sickness insurance, pay the money directly to the patient, who nearly always fails to pass on his benefit payments to the hospital. Dr. Schlink states categorically that any hospital and sickness insurance scheme that does not make payment directly to the hospital should be discontinued, and at this stage he draws attention to the non-profit hospital insurance systems that have been introduced into the United States of America. By these schemes the public can take out insurance for as many hospital days as desired, and at the time of compilation of the report there were 5,000,000 insured persons in the United States. The hospitals, not the insurance companies, conduct this insurance; actually the insurance companies have helped and encouraged the hospitals to undertake this type of insurance. The patient has free choice of medical attendant and institution. Dr. Schlink considers that it is simple to work out the rates of non-profit insurance, once the local average bed cost per day and the average length of stay in hospital have been worked out. He believes that a hospitals' contribution scheme should be made compulsory, since such a scheme is not a tax, but an insurance that gives direct personal benefit in time of need. He points out that the national health insurance scheme introduced by the Commonwealth Government made no provision for hospital maintenance and payments, and considers that a State hospital insurance scheme would solve most of the hospital maintenance difficulties in New South Wales.

From the figures quoted it is obvious that endowments, donations and subscriptions as sources of revenue are "drying up"; Dr. Schlink expresses the opinion that this fact is due to modern taxation and "the loss of humanities by the community". The auxiliaries and social workers do useful work; but the results achieved fall far below the energies expended on their activities. Dr. Schlink thinks that modern people want some return for their money; he believes that "there is more hope in encouraging big firms and corporations to give large donations and in return to allow them the privilege of free hospitalisation for their employees". Dr. Schlink has tried the experiment at the Royal Prince Alfred Hospital; in return for a donation of £2,000 he promised one employer as much free accommodation for his employees in Gloucester House as the 4% interest on the donation would provide—a total of twenty-four weeks in one year. Dr. Schlink recommends the procedure; he states that it is a sound business proposition for the hospital and the employer.

Finally Dr. Schlink points out that there has never been a consistent plan to meet the growing hospital needs of the community. The unwieldy distribution of the city hospitals he considers to be due in large measure to "a substantial donation, or the political needs of the Member of the district"; the problems that have arisen during the growth of the hospitals have remained "hidden in the fields of speculation, hope, theory or badly calculated probabilities". No proper attempt has been made to correlate the number of births, illnesses and injuries that determine the amount of hospital care needed in the community. No consistent authority has been set up to control the number, size and site of the hospitals built; the finances of the hospitals are in a most unsatisfactory state, since there has been no plan to coordinate, limit or expand their various activities. Dr. Schlink considers that the inauguration of the Hospitals Commission was a move in the right direction; but the Commission is fully occupied with the everyday difficulties of the various institutions that it controls, as well as with the task of allotting maintenance moneys, inspecting hospitals, settling disputes and so on.

Dr. Schlink urges the establishment of "a small hospital survey committee" to advise the Government on this problem. Since no routine matters would be referred to it, its work would not clash with that of the Hospitals Commission or the Department of Public Health. Its chief function would be to ascertain the needs of the community and to form a rational plan for meeting them. Dr. Schlink thinks that this committee should follow the lines of the hospital survey of New York that was begun in April, 1935, and completed in February, 1937, and he points out that much information of value is contained in the archives of the Department of Public Health and of the Hospitals Commission. The committee suggested by Dr. Schlink would be small and would have power to coopt the numerous experts who would be required to supply information. The objects of the committee would be as follows: (i) to bring about a more intelligent expenditure of available funds; (ii) to prevent unwise capital expenditure; (iii) to establish proper methods for financing hospital deficits; (iv) to set up a long-range plan of hospital coordination; (v) to bring about the development of standards through the hospitals of the State. The committee should be expert and free from all political influence. Dr. Schlink thinks that the question of whether such a survey should interest the Commonwealth authorities is a matter for the political leaders; it is difficult to determine the point at which the State's responsibilities in health problems end and the Commonwealth's responsibilities begin. Dr. Schlink argues that, since the defence of the country is undoubtedly a Commonwealth concern, and since the health of the people is the first line of defence, "it is reasonable to suppose that the Federal authorities are interested in the hospital problem". Under present conditions the Commonwealth authorities demand a great deal from the State hospitals, and Dr. Schlink believes that they should be prepared to take some interest in the financial well-being of the institutions. Since hospitals serve many generations, they should be looked upon as a national asset and their construction should be a Commonwealth responsibility. But their maintenance costs are the responsibility of the generation of citizens that makes use of them, and thus, in Dr. Schlink's opinion, these costs should be the responsibility of the State in which they exist.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on November 21, 1940, at the Prince Henry Hospital. The meeting took the form of a number of clinical demonstrations arranged by the Directors of Post-Graduate Medicine and Surgery.

Colostomy and its Management.

DR. H. R. G. POATE showed two male patients in whom it had been found necessary to establish a permanent colostomy. One man had undergone perineal excision of the rectum for carcinoma, and in his case a left inguinal colostomy had been established. In the other case the original diagnosis of carcinoma of the ampulla of the rectum had been overlooked; the patient had been treated for several months for internal hæmorrhoids and had received in all 40 injections. Apparently the error in diagnosis had been made because a digital examination had not been carried out; examination made with a proctoscope

did not reveal the growth in the rectum itself. When laparotomy was performed it was found that he had a metastasis in the liver, which rendered radical operation inadvisable. In addition he had extensive diverticulosis of the descending and pelvic portions of the colon, with a good deal of inflammatory reaction as a result of chronic obstruction. It was thus necessary to perform a colostomy in the transverse colon.

Dr. Poate said that one point of practical importance was that an area of skin and subcutaneous tissue, some four centimetres in diameter, should be excised down to the muscle. This allowed the colostomy to sit well on the abdominal wall and prevented any subsequent cicatricial stenosis. As far as the management was concerned, patients should be instructed to wash out the proximal bowel each day at a regular hour. It was best for them to lie flat on their back and use a large-sized catheter (for instance, a number 12), to which a funnel was attached. It was easy to roll on the left side and to complete the emptying of the bowel by massage along the course of the caecum and transverse colon. In cases in which only a palliative colostomy had been performed, a rectal tube should be inserted and the lower part of the bowel should be washed out with some mild antiseptic solution every second or third day. This prevented irritation by retained discharges. After many experiments with various types of pads, belts *et cetera*, it had been found most convenient for the patients to wear a simple light canvas abdominal binder over two six-inch or eight-inch square pads of cotton wool. The centre was plucked out of one pad, which was applied directly to the skin over the colostomy, the skin having been lightly smeared with "Vaseline". The second intact pad was then put over this and the binder held all in place. A small square of protective material over the second square helped to keep the binder clean. The main thing for the patient's comfort was to try to establish a regular daily evacuation of the colon.

Diseases of the Thyreoid Gland.

Dr. Poate then showed a number of patients suffering from disorders of the thyreoid gland. The first, a male patient, aged fifty-four years, had noticed a swelling in the left side of his neck for twenty-five years. Over the last twelve months he had begun to suffer from dyspnœa on even slight exertion, palpitation, hot flushes, loss of energy and nervousness. During this period the tumour had increased in size. These symptoms varied considerably; but it was apparent that the adenomatous thyreoid was beginning to cause some toxicity. On his admission to hospital his pulse rate was 96 per minute, and regular. The basal metabolic rate was −5%, so that he was apparently in the stage of remission.

At operation a left lobectomy was performed, as there was a large adenoma involving most of this lobe. The right lobe appeared normal. Convalescence was uneventful.

The second patient, a male, was aged forty-six years, but looked ten or fifteen years older. He complained of pronounced loss of weight over the previous seven months, in which time he had lost nearly two stone. In this period he had suffered from palpitation, sweating, nervousness, tremor and loss of energy. He had a fine tremor, but no exophthalmos. The thyreoid gland was palpable, but did not appear to be unduly enlarged. His pulse rate at that time was 120 per minute; but after two weeks' rest in bed, during which time it had varied from 80 to 104 per minute, his pulse rate settled to between 80 and 90 per minute. The basal metabolic rate was +6%; but he was considered to be suffering from low grade thyreotoxicosis in a stage of remission, and a total thyreoidectomy was performed, as he had a very deeply situated, enlarged and obviously abnormal gland. He had a mild post-operative reaction, but his condition was settling down satisfactorily.

The third patient, a male, aged forty-five years, had suffered from breathlessness on exertion with increasing nervousness, palpitation, thumping heart and extreme lassitude for the past twelve months. Twelve years earlier he had undergone removal of the right lobe of the thyreoid gland for thyreotoxicosis. He was very ill at the time, but recovered fairly well and was able to work until twelve months earlier. The left lobe of the thyreoid gland was palpable; his pulse rate was irregular, and it was found that auricular fibrillation was present. The basal metabolic rate on his admission to hospital was +41%, and the estimations at weekly intervals were +33%, +29%, +28%.

The fibrillation persisted. He gained only three pounds in weight in a month, but the tremor disappeared and he felt much better. At operation a very large deeply situated left lobe of thyreoid with a retrosternal projection was found. This was completely removed, and he was left with only a small portion of thyreoid in the region of the isthmus. He had practically no post-operative reaction, and his condition was improving rapidly, although the fibrillation had not yet ceased.

Dr. Poate then showed a female patient, aged forty-nine years, who stated that she had always had a lump on the lower part of the neck, which had not altered in any way. For several months past she had complained of loss of weight, which had fallen from eight stone to six stone three pounds. She suffered from increasing weakness and nervousness. She was placed in hospital and after seven weeks she was admitted to Prince Henry Hospital. She had no tremor and no exophthalmos. The basal metabolic rate on her admission to hospital was +41% and her weight was six stone. The metabolic rate, estimated at intervals of one week, was +24%, +28% and +16%. The pulse rate varied from 80 to 100 per minute, and it was quite regular.

On October 24, 1940, her liver function was estimated by the hippuric acid excretion test, and it was found that 82% of the total benzoic acid was excreted within twenty-four hours, a figure which could be regarded as normal.

On October 31, 1940, she was submitted to operation and total thyreoidectomy was performed. She had only a slight post-operative reaction, but fibrillation appeared for a few days. The thyreoid gland removed measured 6·0 by 5·0 by 3·5 centimetres; its normal anatomical structure was distorted by adenomata up to 3·5 centimetres in diameter. Dr. Poate said it was thought that the patient would require very little, if any, thyreoid substance, and she should be restored to normal health in the course of a couple of months.

The second female patient shown by Dr. Poate was aged fifty-three years. She had first noticed a swelling in the right side of her neck some two years earlier. In the past year she had suffered from increasing dyspnœa on exertion and general debility. She had had no loss of weight. There was a moderately large adenomatous swelling in the left lobe of the gland, and the right side also was somewhat enlarged. Her weight was nine stone twelve pounds. The basal metabolic rate was +7% and the pulse rate 80 per minute. A blood count revealed that the erythrocytes numbered 3,600,000 per cubic millimetre and the hæmoglobin value was 63%.

At operation on October 17, 1940, a total thyreoidectomy was performed, as the whole gland appeared to be involved in the degenerative process. The gland removed measured 7·5 by 4·5 by 4·5 centimetres, and it contained a unilocular cyst 4·0 centimetres in diameter. Many adenomata of varying sizes were also present. Her convalescence immediately after operation was uneventful; but ten days later signs of infection appeared in the neck and finally some pus was discharged. Her general condition was unsatisfactory and she became very lethargic. On November 5, 1940, treatment with one grain of thyreoid substance twice a day was instituted; since then her condition had improved steadily. It appeared that this patient would require a maintenance dose of thyreoid substance.

The next patient shown by Dr. Poate was a female, aged thirty-eight years, who had consulted her doctor some three months earlier because of increasing weakness, palpitation, nervousness and inability to carry on with her work. She had not noticed a swelling in her neck until her doctor pointed it out.

On her admission to hospital there was obvious diffuse enlargement of the thyreoid, which was apparently of the hyperplastic type. She had tremor and some degree of exophthalmos. Her pulse rate was 120 per minute, her weight six stone nine pounds, and her basal metabolic rate +53%. Two weekly estimations of the metabolic rate gave the following results: +26%, +20%. She gained seven pounds in weight. It was thought then that she would be fit for operation; but on that day her pulse rate increased again and her basal metabolic rate was found to be +46%, and at subsequent weekly estimations it was +42% and +45%; she had a very irregular pulse rate. The liver function on November 14, 1940, was shown to be entirely normal. In view of the basal metabolic rate and the pulse rate, it was decided to submit her to deep X-ray therapy prior to operation.

Dr. Poate then showed a female patient, aged fifty-nine years, who had had a very large thyreoid for thirty-five years. In the past six months she had suffered from palpitation, shortness of breath, increasing nervousness, debility, sweating and tremor. She was treated in hospital for three weeks prior to her admission to Prince Henry Hospital, and her pulse rate had varied from 100 to 120 per minute over the whole period. Her basal metabolic rate was +56% and her weight ten stone two pounds.

Since her admission to hospital her pulse rate had been somewhat irregular, varying between 80 and 120 per minute. She looked a feeble old woman. A blood count

revealed that the erythrocytes numbered 4,700,000 per cubic millimetre and the hæmoglobin value was 78%. Her basal metabolic rate on November 5, 1940, was +71%, and a week later it was +67%. Her liver function was estimated on November 15, 1940, and was found to be only 63% of normal, despite the fact that she had been in hospital receiving efficient treatment for over four weeks. The carbon dioxide capacity of her blood was 64 cubic centimetres per 100 cubic centimetres of serum; this was to be regarded as a rather high normal, with a tendency towards alkalosis rather than acidosis. It might be accounted for by the fact that she had had a good deal of alkali during her period of hospital treatment.

Dr. Poate said that the liver function test confirmed the clinical opinion that the patient was unfit for operation and would require further treatment before it was safe to subject her to thyreoidectomy. It was probable that total removal of the gland would be the best treatment in her case.

Bilateral Laryngeal Nerve Paralysis.

Dr. Poate then showed a female patient suffering from bilateral laryngeal nerve paralysis. He said that every few months they had referred to them at the clinic patients with laryngeal nerve paralysis. The patient shown was aged twenty-nine years and she had been operated on five years earlier for acute thyreotoxicosis. She stated that her post-operative reaction was very severe, and she was expected to die; but she made a slow recovery, with complete loss of voice. Two years prior to the meeting she had her vocal cords removed and received some benefit for about twelve months; but in the past year she had had increasing difficulty with breathing. Dr. Godsall reported that both cords appeared to have regenerated; they were fixed and were practically in the mid-line.

The girl was quite unable to do any work, and it was suggested that the operation described by Brien T. King, of Seattle, should be performed, in the hope of giving her some relief, although her voice could never be restored. This operation consisted essentially of transplantation of the anterior belly of the omohyoid muscle into the arytenoid cartilage after preliminary tracheotomy. Of thirteen patients operated on, King had reported good results in eight.

Popliteal Aneurysm.

Dr. Poate then showed a male patient, aged sixty-six years, a clerk, who had noticed a swelling behind the right knee for some three years, which had gradually increased in size. He had had no pain. On examination a rounded pulsating swelling some 7·5 centimetres in circumference was felt in the right popliteal space. The *dorsalis pedis* artery was not palpable, but there was good pulsation in the posterior tibial artery. There was a moderate degree of venous distension. The systolic blood pressure was 170 and the diastolic pressure 130 millimetres of mercury. The urine was normal, and the Wassermann and Kline tests produced no reaction.

On October 29, 1940, proximal ligation of the popliteal artery was performed. A week later the right great toe and the distal portion of the adjacent three toes had become black. By November 20, 1940, all toes were affected with a dry gangrene, and there were some cutaneous blebs on the lower third of the legs. These blebs had since cleared satisfactorily, and it seemed apparent that he would lose his toes only and should have a useful limb. The popliteal swelling had decreased in size and felt firm.

Acute Liver Failure.

Dr. Poate then discussed acute liver failure. He said that the condition appeared to be more intimately associated with thyreotoxic states than with any other disease, except perhaps surgical diseases of the biliary tract. From what was known of the condition, it accounted for what used to be termed "thyreoid crisis", for which there seemed no adequate explanation. In the thyreoid clinic at the Prince Henry Hospital the question of liver function was first investigated by Dr. F. H. Mills, one of the research students; and so impressive were his findings that the hippuric acid excretion test had been adopted as one of the routine investigations.

Acute liver failure was a condition characterized by what appeared to be a fulminating toxæmia directly sequential to operative intervention. The patient did not wake up in the normal fashion after an anæsthetic, but remained stuporose. The temperature and pulse rate rose steadily and rapidly. Coma ensued, the blood urea level rose, the renal secretion failed, and death occurred in twenty-four to thirty-six hours, the temperature having risen to 106° or 108° F. and peripheral circulation having failed. The condition was invariably associated with degenerative or even necrotic changes in the liver cells spreading from the centre of the liver lobule towards its periphery. Apparently either some toxic substance was set free or else there was a sudden and absolute failure of the detoxifying action of the liver. As a result the toxins in the blood stream could be excreted only by the renal tubules, which gave way under the strain, and thus the picture of the hepato-renal collapse was completed. The initial lesion was in the liver, and a predisposition to it was brought about by chronic illness, faulty diet, anæmia, alcoholism and wasting. Thyreotoxic conditions were especially likely to cause it because of the increased metabolic rate, and it was worthy of note that prolonged iodine medication was also a factor. The individual might appear to stand the stress and strain of his ordinary living conditions; but if an anæsthetic and a major operative procedure were superimposed, the liver could not bear the added burden. It was surprising to find the number of cases in which liver deficiency occurred in degrees varying from 30% to 60% of the normal; anything below 60% was regarded as in the danger stage.

One good thing about these liver deficiencies was the rapid improvement brought about in the patient's condition in most cases by a diet rich in carbohydrates and protein and poor in fat. The intravenous administration of 10% dextrose in saline solution might tide a patient over a critical period, especially if high percentage oxygen therapy was used to combat the anoxia which seemed to be part and parcel of the condition. The body fluids had to be maintained; and in cases in which the metabolic rate was high, the onset of acidosis had to be watched for and guarded against. In cases in which very free loss of body fluids had occurred—for example, in intestinal obstruction, acute dilatation of the stomach *et cetera*—alkalosis might be induced unless correct steps were taken to make good the fluid lost. Adrenaline and its substitutes were contraindicated, as there was some reason to believe that in such a critical state an excess of adrenaline was thrown out. The best stimulant to ward off the peripheral circulatory failure seemed to be "Coramine". It was as well to remember that this condition was met with apart from thyreotoxicosis, and had been reported to follow appendicectomy, colostomy, hysterectomy, intestinal obstruction and operations on the biliary tract. Recently a fatal case had occurred at the hospital after repair of a ventral hernia.

(To be continued.)

Medical Societies.

THE PUBLIC MEDICAL OFFICERS' ASSOCIATION OF NEW SOUTH WALES.

THE fifteenth annual general meeting of the Public Medical Officers' Association of New South Wales was held at the British Medical Association House, 135, Macquarie Street, Sydney, on January 23, 1941, DR. E. H. RUTLEDGE, the President, in the chair; 20 members were present.

Financial Statement.

Dr. C. E. Percy presented his financial statement. It showed receipt of £38 1s. 5d., being £24 5s. from annual subscriptions and £13 16s. 5d. interest on invested funds. Expenditure was £5 15s. 8d. The accumulated funds total £545 7s. 8d., being £400 invested on fixed deposit, £100 in Citizens' National Emergency interest-free loan, £23 12s. in Commonwealth Savings Bank, £21 0s. 11d. in current account and 14s. 9d. petty cash.

Annual Report.

The Secretary presented the Committee's report for the year 1940, as follows:

As is fitting in a time of war, the activities of the Association have been reduced to a minimum during the year 1940. The Committee met only six times and little beyond routine business was considered. The attendances of group representatives at meetings of the Committee were as follow: Dr. S. Evan Jones, 3; Dr. H. H. Nowland, 4; Dr. J. Cooper Booth, 4; Dr. C. E. Percy, 5; Dr. J. McManamey, 6; Dr. G. L. C. Saunders, 4; Dr. Dorothy McClemens, 5; Dr. W. K. Flook, 4; Dr. E. H. Rutledge, 6; Dr. H. H. Willis, 6.

The troublous times ahead necessitate a strong association to watch the interests of public medical officers, and the

strength of any association depends on the number and enthusiasm of its members. There are 116 on our roll at present, of whom 11, having retired from the services, are honorary members. The recruitment of new appointees is a task for us all.

It was decided not to take part in the dispute between the Minister for Education and the Teacher's Federation, although the attitude of the Minister was not approved.

Relations with the New South Wales Branch of the British Medical Association remain unchanged. The Secretary was again invited to attend meetings of the Medical Politics Committee to express the viewpoint of the public medical officer. It was decided not to associate the Association with any movement to reform the Branch Council, members being thus free to take any individual action they desire.

The action of the New South Wales Government in paying the difference between civil and military pay of those of our members on war service is much appreciated, and it is regretted that the Federal and some other State Governments are not doing likewise.

Members are again reminded of the necessity of being insured against actions at law for alleged negligence or lack of skill to which they are liable equally as private practitioners. Experience has shown that it is unsafe to rely upon Government support in such cases. The Committee knows of no better insurance than membership of the New South Wales Medical Defence Union.

Following on our representations of 1939 the New South Wales Public Service Board early in the year notified slight but welcome increases in the salaries of female senior medical officers in mental hospitals.

A sum of £100 was lent to the Federal Government interest free as a token of the desire of our members to assist in the nation's war effort.

The Committee has considered complaints of interference by lay officers in the medical administration of departments, but has not seen fit to take any action.

After discussion the report was adopted.

Election of Office Bearers.

The election of officers for 1941 resulted as follows: *President*: Dr. J. Cooper Booth; *Honorary Auditor*: Dr. S. McGeorge; *Honorary Secretary*: Dr. H. Hastings Willis; *Committee*: Dr. Dorothy McClemens and Dr. Edgar Wallace (Education Department), Dr. J. Cooper Booth, Dr. C. E. Percy and Dr. J. McManamey (New South Wales Health Department), Dr. G. L. C. Saunders (Works and Railways), Dr. S. Evan Jones and Dr. H. H. Nowland (Mental Hospitals), and Dr. H. H. Willis (Repatriation Department).

General Business.

A long discussion occurred on a proposal of Dr. Henry to appoint managers from the meeting to discuss with the Public Service Board or other appropriate authority the regulations governing working conditions and the medical staffing of mental and general hospitals conducted by the New South Wales Government. It was agreed that the regulations had been harshly and unreasonably enforced in recent years and were antiquated and badly in need of reform, but there was difference of opinion as to how and when this should be done.

Dr. A. T. Edwards, Dr. S. Evan Jones and Dr. J. McManamey were elected as managers and the conduct of the case was left in their hands, a suggestion that a legal practitioner be briefed being strongly opposed as being expensive and unnecessary.

Dr. Dorothy McClemens and Dr. Madeline Gors stirred the meeting by moving without notice (as was permissible) to abolish the entrance fee required of each new member, and to exempt from further payment of annual subscriptions members of fifteen years' financial standing. On the demand of Dr. Ewan the clauses of the motion were put to the meeting separately. The former was negatived, but the latter carried by a substantial majority. On a count of the meeting being then demanded it was found that the quorum required by the rules was present. As a result of this decision the foundation members of the Association still on the roll become life members.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 16, of January 30, 1941.

CITIZEN NAVAL FORCES OF THE COMMONWEALTH.

Royal Australian Naval Reserve.

Appointments.—Hamilton D'Arcy Sutherland and Derek Napier McKenzie are appointed Surgeon Lieutenants, dated 9th November, 1940, and 23rd December, 1940, respectively.

Promotions.—Surgeon Lieutenant Eric Mortimer Tymms is promoted to the rank of Surgeon Lieutenant-Commander, dated 1st January, 1941.

AUSTRALIAN MILITARY FORCES.

NORTHERN COMMAND.

First Military District.

Australian Army Medical Corps.

Honorary Captain K. W. Priddis is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 30th November, 1940.

Australian Army Medical Corps Reserve.

To be Honorary Captain.—Robert Graham Brown, 11th December, 1940.

The resignation of Honorary Captain S. F. M. Yeates of his commission is accepted, 16th December, 1940.

To be Honorary Captain.—Jack Roy Hutcheon, 4th December, 1940.

EASTERN COMMAND.

Second Military District.

Australian Army Medical Corps.

To be Captains (provisionally).—David Clive Critchley Hinder, 3rd December, 1940; Desmond James Brennan, Douglas Neil Gillies, 11th December, 1940; Ian Stanley Booth, 18th December, 1940; and Florence Mary Voss, 20th December, 1940.

Captain W. F. L. Liggins is appointed from the Reserve of Officers (A.A.M.C.), 19th December, 1940.

Honorary Captain R. H. Kaines is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 3rd June, 1940 (in lieu of the notification respecting this officer which appeared in Executive Minute No. 175/1940, promulgated in *Commonwealth Gazette* No. 190 of 1940).

Honorary Captains D. L. Cropp and M. R. Robertson are appointed from the Reserve of Officers (A.A.M.C.), and to be Captains (provisionally), 30th November, 1940.

To be Captains (provisionally) supernumerary to establishment pending absorption.—Andrew Moncrieff Barron, 1st November, 1939 (in lieu of the notification respecting this officer which appeared in Executive Minute No. 11/1940, promulgated in *Commonwealth Gazette* No. 4 of 1940), Patrick Macartney De Burgh, 29th November, 1940, and John Iredale Tonge, 2nd December, 1940.

To be Captain (provisionally).—Vincent John McGovern, 3rd December, 1940.

Honorary Captain W. S. Dawson is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 30th November, 1940.

Australian Army Medical Corps Reserve.

To be Honorary Captains.—Alan Joseph Canny, 10th December, 1940; and William Cecil Rhodes Sim, 18th December, 1940.

To be Honorary Captain.—Thomas Patrick Tighe, 3rd December, 1940.

SOUTHERN COMMAND.

Third Military District.

Australian Army Medical Corps.

To be Major (temporarily).—Captain H. S. Jacobs, V.D., 7th December, 1940.

To be Captains (provisionally).—Henry Buckhurst Kay, 30th November, 1940; John Russell Sherwin, 3rd December, 1940; Stephen Douglas Watsford, 12th December, 1940, and William Reade Lane, 17th December, 1940.

Honorary Captains I. C. Heinz and J. P. Catchlove are appointed from the Reserve of Officers (A.A.M.C.), and to be Captains (provisionally), 31st December, 1940.

Australian Army Medical Corps Reserve.

To be Honorary Captains.—John Pelham Catchlove and Theodore Schlicht, 12th December, 1940, and Bruce Justin Robinson, 13th December, 1940.

To be Honorary Captains.—Bernard Gretton-Watson, 14th November, 1940; Albert Elijah Gribble and Eric Ian Fargie, 19th December, 1940.

Fourth Military District.

Australian Army Medical Corps.

Honorary Captain G. M. Hone is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 30th November, 1940.

Australian Army Medical Corps Reserve.

To be Honorary Captain.—Oscar Westcoot Frewin, 6th December, 1940.

To be Honorary Captain.—Charles Duguid, 28th November, 1940.

Captain F. St. J. Poole is placed upon the Retired List with permission to retain his rank, 17th January, 1941.

Sixth Military District.

Australian Army Medical Corps.

To be Major (temporarily).—Captain T. D. Freeman, 21st November, 1940.

Honorary Captain I. W. Holt is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 30th November, 1940.

WESTERN COMMAND.

Fifth Military District.

Australian Army Medical Corps.

To be Captain (provisionally).—Charles Rodger Dunkley, 11th December, 1940.

Honorary Captains L. G. B. Cumpston and A. G. Davies are appointed from the Reserve of Officers (A.A.M.C.), and to be Captains (provisionally), 11th December, 1940.

Honorary Lieutenant F. W. Hammond is appointed from the Reserve of Officers (A.A.M.C.), and to be Captain (provisionally), 12th October, 1939 (in lieu of the notifications respecting this officer which appeared in Executive Minutes Nos. 31/1940 and 55/1940, promulgated in *Commonwealth Gazettes* Nos. 28 and 58 of 1940).

To be Captain (provisionally).—W48 Alan Reid Bean, 14th December, 1940.

Australian Army Medical Corps Reserve.

To be Honorary Captains.—Thomas Miles Gilbert, Leo Francis Healy, James Michael O'Donnell, Alec Siglin and Harry Herbert Wilson, 3rd December, 1940.

Correspondence.

VARICOSE VEINS IN THE RECRUIT.

SIR: During the latter part of last year numbers of military recruits were referred to this hospital for treatment of varicose veins. Many were from the country and could not afford to stay in Sydney for the usual series of injections, which take time and often have no effect. Operative treatment, though ideal, was not generally available because of limited in-patient accommodation. To operate and send them home was considered risky as most of them were staying at boarding houses; so operation was reserved for a few of the worst cases and the rest treated by injection.

But sclerosis of large varicose veins by injection is no easy matter, and it was common to find patients returning a week later with their veins still patent and finances at a low ebb.

A method recently adopted for their treatment has proved so consistently satisfactory that it is possibly worth mention. In a series of some 200 cases it has been found to produce more rapid and extensive "takes" than any other method tried, except that of saphenous ligation at the *fossa ovalis* and subsequent injection. The unfortunate recruit's waiting time is considerably reduced.

The veins are traced proximally to a common trunk or "parent" vein. Instead of ligating it, a tourniquet (rubber tubing and hæmostat) is applied just tight enough to occlude it at its highest visible point. The injection is made an inch or so distal to this, and the tourniquet retained for ten minutes. Light stroking toward the foot helps to spread the sclerosing agent; a short strip of "Variban" is stretched across the needle puncture, but elastic bandaging is dispensed with unless the veins are very large.

Almost invariably venous spasm and thrombosis are present within the ten minutes. The veins diminish in size and mild cramping pain is experienced. Thrombosis is palpable and has been confirmed once or twice by opening a vein. Since thrombosis occurs with the veins in spasm, they cannot dilate again, and this obviates the necessity for bandaging.

After removal of the tourniquet the patient may resume his usual activities and, as with other injection methods, is advised not to confine himself to bed.

The sclerosing agent used is "Ethamolin" 5% in doses of two to five cubic centimetres, according to the size of the veins. This exceeds the amount generally recommended, and is tolerated well. "Ethamolin" is non-irritant to perivenous tissues and comparatively free from undesirable general effects.

The above method illustrates two useful principles: (*a*) that stasis facilitates sclerosis, and (*b*) that by attacking the "parent" vein first, we often sclerose every tributary at one "sitting". If any remains patent, it is dealt with at the next visit.

Occasionally the injection fails to "take" at all; but even so, a repetition of the procedure a few days later is worth trying, and often succeeds.

In spite of excellent results, the method has its limitations, and it is unlikely that these results will be as permanent as those that follow ligation. But it is a valuable substitute when the patient's time and money are limited and ligation out of the question.

Yours, etc.,

P. W. GILL.

Sydney Hospital,
January 29, 1941.

GROUP-CAPTAIN RAYMOND WILLIAM RYAN.

SIR: I thought it might be of interest to members to know that the first Director of Medical Services, Royal Canadian Air Force, under the reorganization scheme is an Australian and a graduate of Melbourne University. He is Group-Captain Raymond William Ryan, of the Royal Air Force Medical Service.

At the outbreak of this war he was sent by Air Ministry to Canada to reorganize the Royal Canadian Air Force Medical Service on Royal Air Force lines, and on completion of this recently was made Director of Medical Services.

Ryan was educated at Melbourne University, graduating M.B., B.S. in 1913.

During the Great War he served with the Royal Army Medical Corps from 1915 onwards, and on the establishment of the Royal Air Force as a separate arm in 1918 transferred to its new medical service.

He has served continuously in the Permanent Royal Air Force since that time, holding posts as Senior Medical Officer, Royal Air Force Hospital, Cranwell, in Iraq, Egypt, and later as Principal Medical Officer, India. From 1936-1939 he held the important position of President of the Central Medical Board at Air Ministry.

He is regarded by the Royal Air Force authorities as a medical officer of great organizing ability and attractive personality.

The Royal Australian Air Force is happy to know that the medical attention of its personnel whilst training in Canada is watched over by a fellow countryman.

Yours, etc.,

VICTOR HURLEY,
Air Commodore,
Director of Medical Services, R.A.A.F.

Air Board,
Air Force Headquarters,
Melbourne.
January 30, 1941.

WELLCOME'S MEDICAL DIARY 1941.

SIR: We have received a cable from Burroughs Wellcome and Company, London, stating that all copies of Wellcome's Medical Diary 1941 have been reported lost in transit to Australia. They regret that owing to war conditions, it will not be possible to replace the 1941 edition of the Diary.

Yours, etc.,

BURROUGHS WELLCOME & CO. (AUSTRALIA) LTD.

Cressy Street,
Rosebery,
Sydney.
February 10, 1941.

Obituary.

JAMES MANNING RAINBOW.

WE are indebted to Dr. John McGeorge for the following appreciation of the late Squadron-Leader James Manning Rainbow.

James Manning Rainbow was born in London, England, on January 17, 1899. He made two visits to Australia with his parents before they ultimately made their permanent residence here in 1913. He was educated at The King's School, Parramatta, where he joined in all sports, but was particularly proficient at shooting. In 1919 he entered Saint Paul's College, Sydney University, and studied medicine. While at the university he was compelled to take a less active part in sport because of a defect in vision, but obtained a "blue" for swimming.

He graduated M.B., Ch.M. in 1924 and became a resident medical officer at the Royal Prince Alfred Hospital for a period and subsequently at the Balmain District Hospital. He then entered the Public Service and spent two or three years as medical officer at Waterfall Sanatorium. After this he went to Adelaide, where he took charge of a women's hospital, returning twelve months later to join the Department of Mental Hospitals of New South Wales. Here he added to a wide general knowledge a thorough training in mental disorders and gained the Diploma in Psychiatry in 1932. He spent some time as senior medical officer at both Callan Park and Broughton Hall Hospitals, and eventually was appointed deputy medical superintendent at Parramatta Mental Hospital, in which capacity he carried out his duties most efficiently and gained the confidence and respect of staff and patients alike. In 1937 he rounded off a sound medical experience with a term as medical officer at the Brisbane General Hospital.

In 1939 he resigned from the Department of Mental Hospitals and commenced practice in his chosen specialty as a psychiatrist in Macquarie Street, Sydney. His jovial manner, his fund of common sense and his keen understanding of human nature caused him to forge rapidly ahead in his career, and he was becoming widely known and the value of his work was being justifiably appreciated when his strict sense of duty impelled him to enlist in the Royal Australian Air Force as a Flight Lieutenant in March, 1940. At this time he had achieved considerable success and had been appointed honorary assistant physician to the Psychiatry Clinic at the Royal Prince Alfred Hospital.

He assisted in the recruiting drives in both Queensland and Victoria and was then attached to the depot at Laverton in Victoria. Eventually he rose to the rank of Squadron-Leader and was stationed at Parkes, New South Wales. On January 28 he was escorting a sick pilot to Mascot by 'plane when it crashed near Glenbrook at 4.45 p.m. and all five occupants were killed. This was a tragic end to a very successful career, but so very typical of the man. He gave up everything at the call of duty and at the end he sacrificed his life while aiding someone who was ill. Knowing him, I feel sure he would not have wished it otherwise.

GEORGE WATT.

WE regret to announce the death of Dr. George Watt, which occurred on February 7, 1941, at Sydney.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Bedkober, Adrian Alan Parker, M.B., B.S., 1939 (Univ. Sydney), 18A, Oxford Street, Woollahra.

Hudson, Charles Burgoyne, M.B., B.S., 1940 (Univ. Sydney), Sydney Hospital, Sydney.

Corrigendum.

OUR attention has been drawn by Dr. A. R. Hamilton to two errors in the report of his discussion on compound fractures in the issue of February 1, 1941, at page 153. The top line in the second column should read "severed nerves should be peripherally sutured". The fourth line from the bottom of the same column should read: "If the neck of the femur was fractured . . ."

Books Received.

"Aids to Anatomy (Pocket Edition)", by E. P. Stibbe, F.R.C.S.; Tenth Edition; 1940. London: Baillière, Tindall and Cox. Foolscap 8vo, pp. 376, with diagrams. Price: 5s. net.

"A Code of Rules for the Prevention of Communicable Diseases in Schools", issued by The Medical Officers of Schools Association; Tenth Edition; 1940. London: J. and A. Churchill Limited. Demy 8vo, pp. 71. Price: 3s. net.

"Modern Diagnosis", edited by Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., F.R.C.P., and A. Moncrieff, M.D., F.R.C.P.; 1940. London: Eyre and Spottiswoode (Publishers) Limited. Demy 8vo, pp. 286. Price: 12s. 6d. net.

"Special Surgery in Wartime", edited by Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., D.Sc., F.R.C.P., and A. Moncrieff, M.D., F.R.C.P.; 1940. London: Eyre and Spottiswoode (Publishers) Limited. Demy 8vo, pp. 74. Price: 6s. net.

"The Diabetic Life: Its Control by Diet and Insulin", by R. D. Lawrence, M.A., M.D., F.R.C.P.; Twelfth Edition; 1941. London: J. and A. Churchill Limited. Large crown 8vo, pp. 252, with 18 illustrations. Price: 9s. net.

Diary for the Month.

FEB. 18.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 25.—New South Wales Branch, B.M.A.: Medical Politics Committee.
FEB. 26.—Victorian Branch, B.M.A.: Council.
FEB. 27.—South Australian Branch, B.M.A.: Branch.
FEB. 28.—Tasmanian Branch, B.M.A.: Council.
FEB. 28.—Queensland Branch, B.M.A.: Council.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such a notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rates are £2 for Australia and £2 5s. abroad *per annum* payable in advance.